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OF THE

TYNESIDE

NATURALISTS' FIELD CLUB.

1854-8.

VOLUME III.

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TRANSACTIONS

OF THE

TYNESIDE NATURALISTS' FIELD CLUB.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ AT THE NINTH ANNIVERSARY MEETING, HELD IN THE COMMITTEE ROOM OF THE LITERARY AND PHILOSOPHICAL SOCIETY OF NEWCASTLE-UPON-TYNE, ON WEDNESDAY, THE 23D OF MAY, 1855. BY THE PRESIDENT, THOMAS SOPWITH, ESQ., F.R.S., F.G.S., MEMBER OF THE GEOLOGICAL SOCIETY OF FRANCE, &c. &c.

GENTLEMEN—In conforming to the duty which now devolves upon me, of addressing you, at the close of my year of office, as President of this Society; I beg, in the first instance, to express the obligation which I feel by your having made a selection which I cannot but value as an expression of your good opinion, and I much regret that the extensive mining arrangements which occupy my time and attention at a distance of more than forty miles from this town, have prevented my having the privilege and enjoyment of attending your meetings during the past year, except on one occasion.

To those who consider this Club as an associated family of observers, willing and desirous to obtain and disseminate information—willing and desirous also to meet at stated times, and to travel in company to interesting localities—it will be evident that the general objects of such a Society must be greatly

promoted whenever you can have the services, as President, of one who is deeply imbued with the love of Natural History, and whose opportunities, as well as tastes, have enabled him to cultivate a minute and accurate study of one or more departments of Natural Science. It is only to the former of these qualifications that I can lay any claim. The love and admiration of natural scenery, and an intense pleasure in any opportunities of beholding the wondrous revelations which are constantly presented by natural phenomena, have added much to the enjoyment of a life which, for the cause already alluded to, has not been devoted to any but occasional observations, except when combined, as they have often been, with engineering or mining pursuits. The study of any of the chief departments of Natural History in minute detail, has not been compatible with the pursuits of an active life of business; and I feel, therefore, that in this respect I have to claim your indulgence. It may not, however, be without encouragement to others to observe, that the generous views of this Society recognise the humble admirer and occasional observer as well as the zealous follower and laborious student of Natural History.

The present occasion of our Annual Meeting naturally leads to some retrospective views of the proceedings of the past year, and to a consideration of the rise and progress of this Society, which I had the pleasure of joining at its commencement, nine years ago. In April, 1849, it numbered exactly one hundred members. In the next year only ten members were added to the list; but, in the following two years, viz., 1850 and 1851, the accessions amounted to 99; and at the present time the number of members is about 250. Of these the following have been elected during the past year, viz.,—

At the Anniversary Meeting, March 15, 1854, Messrs Clifford, Crighton, D. H. Goddard, Wm. Green, Cuthbert E. Ellison, and Robert W. Bleasby.

At the Dilston Meeting, May 19, 1854, Messrs John Philipson, George Bradley, William Anderson, Alexander Bertram, John Clayton, John Walsh, E. S. Hills, R. S. Newall, St. John Crooks, and H. Penny.

At the BRINKBURN MEETING, June 8, 1854—The Rev. Bowlby Hazlewood, Rev. T. Thackeray.

At the CASTLE EDEN MEETING, July 21, 1854—Rev. W. N. Darnell, Messrs Thomas Pigg, and W. Ainley.

Mr. Storey has furnished me with the following list of the several places visited since the formation of the Society, together with the dates and references to the "Transactions"—which are interesting as affording, in one view, a brief epitome of the proceedings of the Club :—

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The First Field Meeting of the year 1854, was held at Dilston and Devilswater, on Friday, the 19th May, when the following members were present:—Rev. W. T. Shields; Messrs Charles Adamson, G. C. Atkinson, J. B. Browning, Gainsford Bruce, Thomas Burnet, R. Y. Green, R. Howse, jun., J. Stevenson, Joseph Swan, John Thompson, and George Wailes.

I regret that I was unable to be present at the excursion to this romantic locality, the picturesque attractions of which amply repay a visit. Historical associations of great interest are presented by the ruins of Dilston Castle, which occupy a position alike prominent as regards scenery and antiquity; and as our Society embraces Archæological study as one of its objects, it could scarcely have selected a more fitting place for the First Field Day of the year. I have not been favoured with notes of any observations made by the Members who were present; but I may allude to a well illustrated description of the scenery and historical events by W. S. Gibson, Esq., as conveying clear and extensive information connected with this locality.

In a Geological point of view, this part of the country possesses considerable interest, lying as it does midway between the coal fields of the eastern part of Northumberland and Durham, and the carboniferous or mountain limestone districts of the central part of the North of England. Some of the lower seams of the Newcastle coal field, crop out in the valley of the Tyne, a few miles eastward of Dilston; but by the rise of considerable hills and by successive downcasts or dislocations of the strata, these seams are found not only in the adjacent hills, but also considerably to the west. This is shown in a model, which I have prepared, not only to exhibit the general results of this condition of the strata, but as an example of a class of models easily constructed, and which might, I consider, be usefully employed in local museums and in schools. To this, as a means of illustrating the Geological departments of Natural History, I shall hereafter further advert. I may observe that Dilston and the Devilswater form as it were an entrance to moorland and highly picturesque regions, which I am convinced would afford rich materials for enjoyment as well as instruction whenever the field excursions of this Society extend in that direction.

The Second Field Meeting of the year was held at Brinkburn, on Thursday, the 8th June, 1854. The Secretaries, as well as myself, were unable to attend; and I learn from the Minutes that ten of our Members spent a very agreeable day, although "great dissatisfaction was expressed at the absence of the officials of the Club." There is no doubt that, by active and well-directed exertions, those who are honoured by the Society, with official position, may do much to contribute both to the general instruction and enjoyment of the Members who visit distant places; and I can only again express my regrets for an absence, which, as regards myself, was occasioned by my being in London, at the time.

I am glad to state, however, that the following interesting particulars, relating to this Meeting, have been kindly presented by Ralph Carr, Esq. :—

"I had to drive a distance of fourteen miles, nearly due southward, to reach Brinkburn, passing from the vale of the Beamish or Till, across that of the Aln, then over Rimside Moor, and thence down into the comparatively warm and sheltered Coquetdale. A threatening morning sky had gradually opened out on the eastward, from whence the wind came, promising a fine clear noon and evening, which we eventually enjoyed.

"In passing along, it was impossible not to admire the magnificent display of golden whin-flower, varied by the sister broom, although the present is by no means a favourable year for the whin; for, in the severe storm of February and March, 1853, it was sadly cut up all over the country by the duration and bitterness of the frosty wind from the north-east; and again, in December and January, 1853–4, a very keen black frost (when the thermometer fell to a very low point, and all our streams were frozen almost to the bottom), this native, but not very hardy plant, received a further check to its vegetation. Notwithstanding such accidents, there is no region where it is seen in greater perfection than in Northumberland. I had an opportunity, this year, of observing it in the county of Cork, and throughout the line of railway from thence to Dublin, when former impressions were confirmed, that although it is there

agreeably varied by an intermixture of *Ulex nanus*, it never surpasses, in vigour of growth, our own whin-covers. Nor was it this year more than a fortnight earlier there in exhibiting its Easter blossoms, than with us.

"The truth is, that February and March are severe and trying months to vegetation, even in the south of Ireland, where water at the same time may not be frozen. The native pasturage is as white and sear as with us, and all growth is suspended. As the winds perform many of the offices of the sun, in summer, in oceanic climates, so they are capable of checking vegetation at the end of winter, no less effectually than frost, and of bracing the human frame, in like manner. Ireland is a wind-swept country, which enjoys the benefit of a real winter through the operation of the colder winds, and a well-marked contrast between winter and spring, notwithstanding its insular position and nominally mild winter temperature.

"In Ireland, both the whin and the yew, and I may add the holly, exhibit the same tints of green that they show here with us; whereas, in Surrey and Kent, where the sun's power is much greater, their foliage is extremely dark, insomuch that the yew appears truly funereal, and the whin or furze has almost the aspect of a different species. The wastes, covered with luxuriant furze and holly, of rare vigour, symmetry and beauty, in the north-western uplands of Surrey, and the adjoining parts of Berkshire and Hampshire, are well worthy of a visit by the Northern Naturalist. But even amidst that splendid vegetation of a superior climate, he will probably not see any such simultaneous burst of golden flower, or breathe such perfumed air as upon our own hill-sides, in May. At least, in passing through those parts of Surrey, at the beginning of May this year, I was disappointed by finding no general burst of flower at all.

"In Devonshire and Cornwall, the furze puts on a different appearance from any of these. For whilst it keeps its glaucous hue of green, as in the North, it shoots up to a stature that often permits one to walk beneath it without much stooping. This, in all likelihood, must be its character upon the opposite wastes of Brittany, where I have never been.

"But I can testify, that where it has been sown by English railway companies, along the slopes of cuttings and embankments in the province of Brabant, it has lived for two or three years, and made longer and more vigorous shoots than in England; but that a subsequent sharp winter, and hot rapid spring have been too much for it, and have killed it out. Its hue there was glaucous as in the North of England, not dark green, as in Surrey. But this would probably depend in some degree upon the locality from whence the seed was brought; for the hue of the plant would doubtless be hereditary for some time, wherever cultivated.

"In passing through Roughley Wood, and near some of the small gills upon Rimside Moor, that afford sites for little groups of birch, I could not help admiring once more the upland variety of that beautiful native tree, as contradistinguished from the weeping birch of the sheltered Highland lochs and river sides.

"The weeping plant, so exquisitely beautiful in its proper place, is in truth not much hardier than the weeping willow of Babylon, when transferred to the cold uplands which are exposed to every blast of heaven, to great evaporation, and continual loss of warmth by radiation. For such localities a much hardier, stiffer variety has been propagated by the Unerring Hand which directs all the operations of wild nature. And in all exposed plantations upon our plains and table-lands, the stiff upland birch ought to be sedulously cultivated. Upon all dry soils also this is the birch to resist evaporation, and to reward the planter.

"At Brinkburn, the beautiful ruin of the Priory was examined in the company of several Members of the Club who had arrived at an earlier hour from Newcastle, and who, after a ramble up the Coquet, had returned to the old venerable walls and aisles.

"We had the advantage of examining some of the most interesting features, with the assistance of the Rev. Thomas Finch, of Morpeth, who had joined the party, and was well qualified to lead us at this spot.

"There is in the woods a fine growth of the most characteristic native underwood of Northern Britain; and the odours of the

remnants of the Old Forest of Coquet were upon every breeze, to which the aromatic foliage and shoots of the wild-briar, the flowers of the hagberry (*Prunus Padus*), hawthorn, and sycamore, largely contributed. Upon the leaves of the latter there was a copious honey-dew, deposited by numerous Aphides, which, occupying the under-sides of each leaf, protects the humid liquid upon the surfaces of those below. But for the timely relief afforded to bees, by this honey-dew upon the sycamore, the result of the great production of Aphides, during the last three weeks of moist cloudy weather, there must have been a very extensive mortality indeed in our apiaries; and it is undoubtedly a beautiful compensation of Providence, that the very clouds which render flowers almost destitute of honey, produce an accumulation of watery sap in the foliage of the sycamore and other maples, which again favours the development of the countless tribe of Aphides, the parents of that honey-dew which saves so many hives in their extremity, at a season when the young bees require an unceasing supply of food.

"In regard to the sycamore, I cannot help here observing, that, in the plains of Germany and Northern France, it is a rare tree, occurring only where planted. In the hill-woodlands, it is frequently met with growing wild, as in Ardennes, the Odenwald, the Black Forest, and in Switzerland. But nowhere in these central parts of Europe does it seem so common in a wild state as in the woodlands of Wales and Cumberland, and in many parts of the West and North of England. Very probably, when nursery gardens were rare about London, young sycamores, with limes, horse chesnuts, poplars, and other ornamental trees, for parks and avenues, might be sent from the Netherlands and Germany (where nursery gardens were of earlier date) into England; and hence an idea would arise that the tree itself was exotic, especially as it is really hardly wild near the metropolis. I cannot conceive any other foundation for the notion of its not being as much a British tree as the ash or the birch. There are probably more self-sown sycamores in Wales, than in any tract of Continental Europe, of the like extent. There too it has its own ancient appellation. In Ireland again it occurs abundantly."

The Third Field Meeting was fixed to be held at Lindisfarne, on Thursday, the 29th June; but the unfavourable state of the weather prevented its taking place, nor did another opportunity occur, during the season, of visiting this distant but interesting locality. Holy Island, and the adjacent coasts and islands, are in many respects extremely curious and interesting. The basaltic rock, which forms so prominent a feature in the geology of the central and eastern parts of the North of England, may here be studied with advantage; and the Artist and the Antiquary cannot fail to derive much gratification from the scenery and antiquities. Among the birds which frequent Holy Island, I had the good fortune, on a former visit, to obtain an excellent specimen of the Northern Diver, which is now in the collection of my friend Mr. John Hancock, and is considered by him a good example. The ruins of Lindisfarne have been rendered familiar by the excellent drawings of the late T. M. Richardson of this town, and by numerous engravings from the drawings of Allom and others. A plan, and most accurately detailed account of this venerable structure, is given by the Rev. James Raine, in his "History of North Durham;"* and I well remember that this account, when it first appeared, was characterised by an able critic, the Rev. Anthony Hedley, as a masterpiece of Topographical and Antiquarian description.

In one of my journals, containing some occasional notices such as the few and short intervals of professional occupations permitted me to make, I find the following memoranda relating to this locality:—

"Holy Island is adjacent to the coast of North Durham; an extensive plain of sand intervenes between the Island and the main land. In no other part of the kingdom, probably, is there so wide and perfectly level a tract of sand, between two portions of cultivated land. The distance is about three miles, and at high water, the whole is covered to a considerable depth. Holy Island consists of a nearly square portion of land at the south-eastern extremity, and of a long and irregular ridge of sandy ground. It presents a very striking appearance when viewed

* Page 137.

from the sands; and its features are such as to afford a rich treat to the Artist, the Antiquary, and the Geologist. The fine marine scenery here has been delineated in several admirable paintings by various Artists, and especially by Richardson, of Newcastle, and Carmichael. The Antiquary reverences a spot which teems with marvellous histories; and a deep tide of recollection flows upon his mind, as the venerable ruins of Lindisfarne are gradually unfolded to his view. Poetic visions, consecrated by the muse of Scott, invest the Island with a deep interest to the lovers of romance; and the Architect will find many lessons of his art deeply furrowed in the ancient walls, and rich mouldings, and clustered columns of the stately ruins of the monastery. The Geologist, even from a distance, revels in a view of some of the most remarkable features of the North of England, presented by the bold basaltic cliffs, the mountain limestone, and the sandstone caverns of Holy Island. It is curious to observe the amazing number of little points, or knobs of sand, raised by sand worms: these, when rendered prominent by the broad shadows projected by the setting sun, give a forcible impression of the amazing operations of animal life dispersed through Nature's works, whether in the sea or dry land—in the midst of luxuriant cultivation, or in a barren plain of sand. The ocean is ever beautiful and sublime: its mighty waves and long lines of foaming billows were pressed onwards by a strong north-east wind. On the south margin of our view, rose the towers of Bamburgh, perched on the summit of basaltic cliffs, and in the distance lay the Fern Islands. Towards the west, the eye ranges over the rich farming district of Norhamshire, and the prospect is bounded by Cheviot 'frowning in the rear.' Northward, a line of sandy coast, and rocks of the coal formation, extend towards Berwick, and the moors of Lamberton terminate the view in this direction."

The Fourth Field Meeting was held at Castle Eden, where I had the pleasure of meeting the following Members:—The Revs. G. C. Abbes, A. Bethune, and W. Greenwell; Dr. Embleton; and Messrs Joseph Blacklock, G. Bulman, Rowland Burdon, R. Y. Green, Albany Hancock, W. Hutton, C. T. Maling, F. J. Peck,

J. C. Penny, E. C. Robson, John Thompson, G. Wailes, and John Walsh.

The singularly romantic denes or glens, and the coast scenery of the county of Durham, have been frequent as well as favourite places of resort for the Members of this Society.

Castle Eden Dene was visited in	June, 1847.
Hazleden Dene	June, 1848.
Hawthorn Dene	June, 1849.
Ryhope	Sept., 1849.
Hartlepool	Sept., 1850.
Roker and Whitburn	Sept., 1851.
Castle Eden Dene	July, 1852.

None who have had opportunities of observing the rich and varied attractions which these several localities present, can be surprised at such partiality. Several notices of these excursions have been already inserted in your "Transactions," and they, as well as the more elaborate descriptions of local historians, all agree in extolling the romantic scenery, and rare and curious plants; they also agree in deprecating the rapacity of collectors, as regards some of the rarer species which are found in the deep recesses, or rocky banks of the denes.

It is interesting to turn to the pages of Surtees, the accomplished historian of Durham, and trace the musings of a mind so richly stored, alike with antiquarian research and an ardent love of natural scenery, reflecting on the state in which successive grants of land and other historical documents represent this district (still wild and romantic) six centuries ago. He thus pictures forth the aspects of its former condition: "The Castle (of which the certain site cannot now be traced, but which, doubtless, stood near to the rill, the chapel, and the lake) towering above dark ancient woods; the chapel, almost hid on the edge of its little dene, and a few huts huddled together for protection round the mansion of their feudal lord; the dene and the moor, useless except for the purposes of firing, or of supplying thatch and timber for the miserable cottages of the peasantry; and the extent of moss and moor, wood, lake, and

waste, broken only by partial patches of cultivation." "The scene peopled," he continues, "by the feudal lord in chase of the stag, with his train of half-naked serfs, or the monks of Durham, with their black hoods and scapularies, wandering under cliffs overshadowed by giant yews, which 'cast anchor in the rock,' or pealing their anthems in deep glens amid the noise of woods and waterfalls.

"'Sonantes—inter aquas nemorumque noctem.'"

Of its present condition, the same writer gives the following graphic description:—"Mr. Burdon* found the estate, after a century and a half of non-resident proprietors, waste and unenclosed, the chapel in ruins, and not a vestige remaining of the mansion-house. He enclosed and improved the lands, rebuilt the church from the ground, and erected a mansion-house, not less remarkable for the beauty of its situation than for the simple elegance of its structure."† "To the present proprietor," he further states, "Castle Eden is indebted for much both of useful and ornamental improvements—in particular, that, without in any degree injuring the romantic character of the place, the wild beauties of the dene have been rendered accessible by a road carried for three miles from the Castle to the mouth of the dene, on the coast."

"If," continues Surtees, "I have attempted no description of the dene itself, it is for a reason the reader will easily suggest—that it is impossible to convey, in common language, any adequate idea of a ravine four miles in length, varying through its whole extent with the wildest scenery of wood, rock, and waterfall, and terminating on the ocean. I will only add that the dene affords some of the rarest and most beautiful plants which inhabit the northern counties. Bloody Crane's-bill, *Geranium sanguineum*, near the east end of the dene, *Ophrys muscifera*; Lily of the Valley, *Convallaria majalis*, fl. May 17, 1849; *Paris quadrifolia*; and, if not totally extirpated by the rapacity of collectors, the rare Lady's Slipper, *Cypripedium Calceolus*.

* The late Rowland Burdon, Esq.

† A graceful addition to these has recently been made by an ample range of conservatories, from the designs of Julian Hill, Esq., one of the well-known family of Hills, who have, in various departments, been foremost among the promoters of improvement of the present time.

The Magnesian Limestone, which abounds in this part of England, may be examined with advantage in some of the precipitous sides of Castle Eden. Vol. iii. of the "Transactions of the Geological Society of London," 1835, contains an elaborate account of this great deposit of limestone, which not only possesses peculiar interest in relation to the coal-mining operations of the district, but has, of late years, been brought prominently into notice, by the selection of building stones for the new Houses of Parliament, derived from a continuation of the same formation in Derbyshire and Nottinghamshire.

This selection became the subject of a local investigation, and of scientific inquiry, in 1838-9, by four experienced Commissioners—two of them well-known as Geologists, viz., Dr. Wm. Smith and Sir Henry De la Beche, Sir Charles Barry, Architect, and Mr C. H. Smith, an eminent Builder. These examinations were commenced in this district, and one of the forms for making the several requisite inquiries, which was printed in Newcastle, may serve as an example of data for collecting such information :—

Topography.—Name of place? Name of county? Nearest post town? Name of quarry?

Ownership.—Owner or lessee of royalty? Address of the agent? Charge for royalty? Name of the parties now working the Quarry?

Nature of Stone.—Designation? Component parts? Colour? Defects? Depths of beds of workable stone? Names, qualities, and thickness of the different lifts in their order downwards? Cubic feet per ton? Weight per 6-inch cube when quarried? Ditto, when dry? Powers of absorption? Resistance to pressure? Effects of freezing? Specific Gravity?

State of Quarry.—When opened? How much saved? Thickness of cover? If in full work? Means of working? State of quarry head? Angle, or rate of dip? Working, with reference to dip? If productive of wall-stone, and of what thickness? Distance of joints?

Supply.—Present and probable power of supply? Price, at

the quarry, of scantlings, squared to order, per foot? Price of wall-stone (if any), at per ton? Description, extent, and cost of carriage to London? Cost of plain work, per foot, at London wages? Cost delivered in port of London?

General Remarks.—If employed in Roman works, and where? Names and dates of buildings, ancient and modern, wherein employed, and present state of the stone?

The following particulars relating to the Magnesian Limestone from Bolsover quarries, near Chesterfield, in Derbyshire, convey an accurate view of the qualities of this building stone—they are taken from the report of the above-named Commission :—

"The component parts are chiefly carbonate of lime and carbonate of magnesia, semi-crystalline. The colour, light yellowish brown. A cubic foot in its ordinary state weighs 151 lbs. 11 oz. The workable stone is 12 feet in thickness, and is in beds varying from 8 inches to 2 feet thick. Blocks of 56 cubic feet can be procured. The cost at the quarry, tenpence per cubic foot; cost, delivered in London, two shillings.

"A cube of 2-inch sides weighed, in its ordinary state, 4890·8 grains; when well dried, 4881·4 grains; when saturated with water, 5042 grains (absorbing 160·6 grains of water, or ·079 part of the whole bulk). Specific gravity of dry specimens—2·316; of the solid particles, 2·833."

A very valuable paper, on building stones, was read by Mr. C. H. Smith, to the Royal Institute of British Architects, in February and March, 1840, and continued in April and June, 1844. Magnesian Limestone has been little, if at all, noticed in Scotland or Ireland, and, as compared with other rocks, is but scantily supplied in England. It has been so modified by denuding causes as to present many scenes of great variety and beauty, and its protuberances were, in feudal times, occupied by the barons, either for the extensive prospects or commanding situations which they afford—thus Conisburgh, Pontefract, Bolsover, Hylton, and Knaresborough Castles; Hardwick Hall, and Tynemouth Abbey and Castle, each rests either on an escarpment or outlier of Magnesian Limestone.

As regards this building stone, the Commissioners concluded, that, in proportion as it is crystalline in structure, so does it appear to resist the decomposing effects of the atmosphere. Professor Daniell, of King's College, after numerous experiments, arrived at a similar result—stating, that "the nearer the Magnesian Limestones approach to equivalent proportions of carbonate of lime and carbonate of magnesia, the more crystalline and better they are in every respect. The several tables annexed to the Report of the Commisssioners, afford a vast mass of information respecting Magnesian Limestone and other building stones, and present admirable illustrations of a great variety of practical details, which some of the Members of this Society might with advantage apply to the general objects we have in view.

I must not omit to mention, that, by the kind permission of Mr. Burdon (a Member of the Club), the party who assembled on this occasion were allowed the privilege of access on a day when the grounds were not open to the public, as they frequently are at stated times; and the further advantage was afforded of Mr. Burdon's company and intelligent explanations, which were highly gratifying to the Members present. Refreshments, provided by Mr. Burdon, proved highly acceptable to several of the Members; and I am unwilling to pass over, without a comment of thanks, the humbler, but extremely kind hospitalities, experienced by two of my companions and myself in the cottage of the teacher of the village school.

The Fifth Field Meeting was held 11th August, 1854, in a more elevated, but equally romantic and curious locality, known as the district of the Northumberland Lakes—being a tract of country nearly midway across the Island, and lying a few miles north of the River Tyne. There were present, on this occasion, the Revs. W. T. Shields and R. Thompson, and Messrs B. B. Blackwell, J. Blackwell, jun., Thomas Coates, Joseph Dinning, J. B. Falconar, jun., W. Falconar, R. C. Frost, R. Y. Green, W. J. Hardcastle, E. S. Hills, and J. Walsh.

I have not been furnished with any Botanical or other notices of this Meeting, and suppose the time and attention of the excursionists to have been abundantly occupied by the extensive

character of the moorland scenery, and by the numerous and truly remarkable remains of the Roman wall and stations. Of the general appearance of the wall, an illustration was inserted, in 1838, in the "Pictorial History of England" (vol. i. page 50), from a drawing which I furnished; and since that time, several excellent delineations of the stations, wall, altars, &c., have appeared in "Hodgson's History of Northumberland." Still later, two editions of Dr. Bruce's "Account of the Roman Wall" (to be shortly followed, I am happy to say, by a third), have given, in great detail, such clear and beautiful illustrations of the scenery, architecture, and antiquities of this great work, as to have familiarised the public with the chief features which deserve attention in the district of the Northumberland Lakes, in the midst of which the wall is proudly reared on the summit of basaltic cliffs. About twenty years ago, I made manorial surveys of this remarkable district; and both then, and on many subsequent occasions, have had opportunities of examining it, and of sketching many of the more striking objects. In these visits, I often enjoyed the agreeable and most instructive companionship of the Revs. John Hodgson and Anthony Hedley, the latter of whom, for some years, resided in this locality, in the romantic villa of Chesterholme.

On the 21st of August, 1854, the Sixth Field Meeting took place at Alnwick. I was unable to attend, being on the very eve of departure, for a visit to Norway; I therefore avail myself of the following notice of the Meeting, which appeared in the "Zoologist," for October, 1854, and was, I understand, communicated by one of the Members who were present:—

"Only a small number of Members assembled at the trysting-place, where they were met by Mr G. Tate, who kindly conducted them over some of the many interesting places in Alnwick and its vicinity. The fine old church was first visited; its peculiarities of architecture and ornament admired.

"Leaving its hallowed precincts, the party next visited the beautiful dairy grounds of Her Grace the Duchess of Northumberland; here, as elsewhere throughout the grounds, the many-foliaged forest trees were most prominent objects, many of them

denizens of other climes, apparently flourishing as freely as if beneath their native skies.

"Quitting this scene of enchanting loveliness, the Club proceeded to the Abbey-grounds; where, after examining that ancient building (which, like all of its class, lies in a beautiful well-sheltered situation), they proceeded up well-kept walks, by the borders of the river, and crossing which, at the suspension-bridge, were led onward, by shaded paths, to Hulne Abbey, with many a pause by the way, for examination or remark, as game, both great and small, winged its way, or strolled across the path.

"Refreshed by a little needful rest, most of the party returned to Alnwick, having arranged to look over the Duke's Egyptian Museum. An hour and a-half spent pleasantly there, brought the dinner, which was well served at the White Swan Inn. A notice was read of a rose-coloured pastor (*Pastor roseus*) having been shot at the Stelling, since the last meeting of the Club.

"Mr. Bold read a description of a new Coleopterous insect (*Lathrobium carinatum*), taken on the banks of the Irthing and Devil's-water, mentioning also some additions made to the Insect Fauna, during the day's ramble.

"Diversified topics whiled away the evening right pleasantly, and, when the parting hour came, each Member took his departure, thinking, perchance, as he went, on similar cheerful gatherings to come."

The Last Field Meeting of the year, was held at Tynemouth, on Friday, the 29th September. Eleven members met. The party proceeded along the coast, to St. Mary's Isle. It was high water during the day, so that little or nothing was seen in the department of sea animals or plants. On our return, Mr. Howse pointed out the curious fish-bed in Cullercoats Haven, thrown up by the ninety-fathom dyke. On returning to Tynemouth, the party went down to see the whinstone dyke, and to observe the direction it takes inland (noticed lately very carefully by Captain Vernon and Mr. Hutton), so that, although the new Tyne piers will build it out, its site and direction will be known. On this occasion, the compliment of Honorary Membership of this Club was, for the first time, bestowed. The selection

of two gentlemen, who were requested to accept the compliment, will, I am sure, meet with unqualified approval; and it gives me still greater pleasure to state, that this mark of the Society's approval and esteem was willingly accepted and kindly acknowledged. They were—G. B. Airey, Esq., the Astronomer Royal, and Professor Phillips. Of the valuable and elaborate investigations made by the former, in the vicinity of South Shields, in order to establish more extended and exact data in relation to the earth's density, I would have felt it incumbent on me to make especial mention in some detail; but the learned Professor has obviated the necessity for this, by publishing, in a very clear and popular form, as much of his researches as can with advantage be addressed generally to the public; and in a communication, with which I was lately favoured by him, I learn that the more elaborate and detailed results of these experiments are in course of preparation, to be laid before the Royal Society of London. The learned Astronomer also favoured the public with a most able and explanatory lecture at South Shields. The arrangements made at Harton, by the colliery owners and others, to facilitate the subterranean pendulum experiments, appear to have given entire satisfaction to this zealous investigator, and to have been in conformity, alike with a zeal for science and a regard for hospitality, which I trust will ever continue to distinguish the North of England, and render it worthy of a reputation derived from such names as Hutton, Riddle, the two Stephensons, and of Airey himself—he being, I am proud to say, a native of Northumberland.

Of Professor Phillips, I may truly say that he is not only respected, but endeared to all lovers of science in this district who have enjoyed the benefit of his instruction. With a zeal and industry derived from the example and teaching of his uncle, Dr. Smith, the well-known and honoured father of Geology, Professor Phillips has earnestly devoted his life to Geological Science; and those who remember his lectures, given in this Institution, or who accompanied him in his Geological excursions, or who, day by day, are reminded of his valuable aid by the clear and methodical arrangement of Mineralogical and Geological Specimens

in our Museum, will, I am sure, be glad that the compliment of Honorary Membership has been willingly accepted by one on whom it is so worthily bestowed. The valuable experiments of Professor Phillips, at Monkwearmouth Colliery, to ascertain the temperature of the earth, are so nearly allied in their general nature, and so alike in the care and exactness of the experiments themselves, that they may properly be placed in connection with the researches of Professor Airey; and from the deep and dark recesses of Harton and Monkwearmouth Collieries, the world may be enlightened with results of vast importance in Physical Geography and Astronomical Science—the highest of all departments of natural knowledge; and of these investigations, it may be indeed said, that they are worthy of far higher honours than it is in the power of any local institution to bestow.

An Evening Meeting of the Club was held in this Institution, on the 15th March, 1855, when Mr. Thomas John Bold exhibited two cases of Hymenopterous insects, the major part of which were local specimens—one filled with *Fossores*, or sand and wood-wasps, and the other with examples of the *Mellifica*, or Bees. He read a paper illustrative of the habits of the former, "whose economy," he remarked, "was exceedingly interesting and varied, some of the species storing up caterpillars, others flies, a few spiders, one or two beetles and bees, whilst several make use of *Aphides*, the larva of plant-bugs, and other insects, as provision for their young, which are generally deposited in cells formed in sandy soil, or in burrows made in wood."

Their various stratagems to secure their prey, their wonderful perseverance in transporting it, in spite of every obstacle, to the place of (in many cases) its living sepulture, were dwelt on at considerable length; and Mr. Bold concluded his paper by some remarks on the wonderful adaptation of "means to an end," exhibited by these insects; and expressed his belief that they, as well as every other work of the great Creator, were most certainly not beneath the notice of us his creatures.

Mr. D. Oliver, jun., read a memorandum of an Abnormal Development of Tubers in the Potato.

In this singular case, the axes originating from the "eyes" of

the parent-tuber appeared to have been arrested. Several of the numerous fibrous-like shoots originating from these points are presumed to have pierced the rind of the tuber, or to have developed immediately underneath the rind, and there to have thickened into potatoes of the usual appearance. Another remarkable fact was, that, excepting through the slender shoots, or stems, developing into the daughter-tubers, no direct communication seems to have established itself between these and the parent, although, in some cases, the former were almost completely embedded in the cellular tissue of the latter.

A section was exhibited under the microscope, showing the altered condition of the cellular layer of the parent potato, where it was immediately in contact with one of the enclosed tubers. A sketch and diagrams illustrating this unusual departure from the ordinary development of tubers was also exhibited.

Mr. Oliver also exhibited, under the microscope, the siliceous valves of certain disciform *Diatomaceæ*, remarkably abundant in a deposit obtained from the water-supply of the town. These were referred by him, with but little doubt, to the genus *Cyclotella*, probably to *C. operculata;* the difficulty of their determination, in part owing to the circumstances necessarily attending their collection after a passage through the apparatus and pipes of the Water Company, rested on the possibility of their being the isolated frustules of *Melosira* or other filamentous *Diatom*, or such, rendered by special conditions abnormally free.

Diatomaceæ from other places in the neighbourhood were also upon the table.

Living specimens of *Anacharis alsinastrum* (Bab.), were exhibited, its character and habit cursorily described, and a brief account given of its first appearance and rapid increase in various localities.

Examples of Sporiferous Coal from Fordel, in Fifeshire, the subject of an interesting paper, by Dr. Balfour, in the "Trans. Ed. Royal Society," were also on the table.

The following Members were present :—Revs. G. C. Abbes, and T. Green ; Messrs Joseph Blacklock, Thomas John Bold, Jas. B. Browning, Gainsford Bruce, George Bulman, John Fenwick (in

the chair), R. Y. Green, Richard Howse, William Kell, Edward Mather, Daniel Oliver, jun., Thomas Pattison, jun., J. C. Penny, Thomas Pigg, John Storey, J. Swan, George Wailes, John Walsh, and Thomas Walton.

Mr. Storey exhibited specimens of *Scirpus Tabernæmontani*, gathered by himself, and of *Zostera nana*, collected, at Hartlepool, by Mr. Albany Hancock. The evening was spent very pleasantly, every one appearing to be gratified with the proceedings.

I have been favoured with the following Botanical notes by the senior Secretary, Mr. Storey :—

"Although the past year has not been characterized by the discovery of any plants strictly new to the district, not a few new habitats of some of the rarer species have been detected by Members, since the last Anniversary. The following are deserving of record.

Gagea lutea. Whinnetly Burn, covering a patch of forty or fifty square yards. G. C. Atkinson, Esq.!

Ribes petræum. On the road from Warden, to Chester Hall. Edward Mounsey, Esq.!

Tulipa sylvestris, mentioned by Winch as 'naturalized at Blackwell.' For a specimen of this species, from the same station, gathered in 1854, by Mrs. Barclay, I am indebted to Mr. Mounsey.

Alisma Plantago. 'From the cooling pond of the Sunderland Water Works, at Humbledon Hill. The water in the pond frequently reaches 100 degrees, and deposits a large quantity of lime. The plant has appeared this season for the *first* time.' R. Vint, *in litt.* The leaves of the specimen forwarded to me by Mr. Vint, were covered with a thick coating of lime. The species is very common, but I notice it here on account of the high temperature of the water in which it was found.

Stellaria nemorum. Hedge bank, near Close House, and—

Carduus acanthoides, (β crispus, Bab.), near Cramlington. Mr. Daniel Oliver, jun.

Bupleurum rotundifolium. 'In corn fields to the north and west of Norton, and about Carleton and Redmarshall,

Durham. J. Hogg, Esq.' (Winch, Flor. N. and D., 1832.) Still found there, as I learn from Mr. Hogg, in a letter, dated September 30th, 1854. That gentlemen observes: 'Yesterday, I found vast quantities of the curious *Thorow-wax (Bupleurum rotundifolium)*, in several stubbles, in a clayey soil, to the west of Norton. Indeed, parts of several fields were quite thick with it. I send you herewith a small specimen.'

Sium angustifolium, near Morden Car, Mr Daniel Oliver, jun. !

"In an excursion to the banks of the Wansbeck, in the month of October last, in company with Mr John Thornhill, we noticed—

Viola odorata, below Sheepwash Bridge; near the same place,

Pimpinella magna, a plant which does not appear to have been met with in Northumberland, since the time of Wallis, who mentions it as having occurred at Fairflow and Long Rigge, and on the north-east side of the bridge, at Barwesford.

Scirpus Tabernæmontani (β *glaucus*, Sm.) on the margin of the Wansbeck, about a mile below Sheepwash.

Euonymus europæus, near Camboise.

Zostera nana has lately been found at Hartlepool, by Mr. Albany Hancock, thus extending the distribution of this species, from Northumberland to Durham. The names of several other species, of more frequent occurrence, might be given; but, as it is expected they will shortly appear in the catalogue of flowering plants to be published by the Club, it is unnecessary to mention them here."

Mr. D. Oliver, jun., has also kindly communicated the following note on the *Diatomaceæ* of the district :—

"I have at times, during the past year, cursorily examined some of the mud deposits from various places in our neighbourhood, with a view to ascertain the occurrence and comparative frequency of the *Diatomaceæ*. Without attempting, at present, to catalogue the few which I have already observed, it may interest the Club to know, that after an inspection of such deposits from Jarrow Slake, Prestwick Car, Tyneside; at Scotswood, Blyth,

and in ponds, &c. in our more immediate vicinage, these singularly beautiful organisms appear to be fully represented in our district. I may remark in particular, the occurrence in great abundance, in the water supplied to the town by the Whittle Dean Water Company, of the frustules of a minute discoid species, probably *Cyclotella operculata*, of Smith's Synopsis. Of course others, as *Cymbellæ, Cymatopleura*, &c., are found with it, but not nearly so frequently.

"All well, some future time, I may attempt a more extended review of the species of our neighbourhood. I don't think I have anything new in Phanerogams to report, affecting our Flora."

I have been furnished by Dr. Richardson with a proof impression of some curious illustrations of the microscopic appearance of different varieties of coal, which will shortly appear in a work on which he is now engaged. The subject of Microscopic and other investigations of coal, was alluded to in the address of my predecessor in this chair, Sir Walter Calverly Trevelyan, who justly mentions this train of inquiry as one that, especially in a coal district, might be most properly pursued. In his practical and sensible observations on the difficulty of describing coal by any single and accurate definition, I entirely agree. Indeed, such is the imperfection of human knowledge—such the vagueness and uncertainty of human observation, that it is almost impossible to apply and combine the results derived therefrom, in the same exact manner that mathematical reasoning can be applied. Some of the specimens exhibited in the coloured plates of Microscopic sections of coal, in the work alluded to, are from my own collection, having placed them under the careful observation of Dr. Aitken, of Glasgow, by whom the drawings were prepared; and I have much pleasure in quoting the following observations from the correspondence with which he favoured me on the subject:—

"There can be no doubt that all the coaly substances, called coal in common language, are both chemically and microscopically the result of changes (not altogether understood) upon vegetable matter.

"As coals are generally known and distinguished by various

external physical characters, which determine the class, the quality, and the use to which the various kinds may be applied, so it is also found microscopically, that there are appearances peculiar to the different kinds and qualities of coals. Dr. Hutton, of Newcastle, appears to have been the first who clearly pointed out the nature of coal as seen by the microscope. He pointed out more particularly the existence of a peculiar yellow substance in coals of the cannel kind, and which is seen to form a component part of almost all kinds of coal, with the exception of the anthracites; and this yellow substance is, in a great measure, connected with the quality of the coal, as a gas-yielding substance.

"The microscope shows coal to be composed of (1.) a black substance, in molecular or granular particles; (2.) of the yellow or volatile substance, homogeneous and structureless; and (3.) of earthy mineral matter, mixed with the coaly ingredients.

"These may be considered as the component parts of all coals, the deficiency or entire absence of any of them distinguishing the quality or nature of the coal. Dr. Hutton also showed that the yellow substance was enclosed in spaces, which he supposed to be closed cavities. But if any given section of cannel coal be carefully ground down, it will be found that such cavities communicate with each other; in other words, that they form areolar spaces in many instances. The shapes of these spaces are also very various, determined, doubtless, by internal changes taking place in the coaly mass while it is being transformed, and even subsequent to that event. Internal pressure, combined with the pressure from without and other circumstances, which determine stratification and cleavage, have also something to do with the appearances of the coal, as seen in different sections cut in different directions. A coal must be examined by three sections at least: one corresponding to the horizontal face of the bed—another corresponding to a longitudinal vertical section, or in the line of stratification—a third, across the line of stratification. Each of these sections will show differences of appearances, according to the nature of the coal, and the pressure, or other physical influences, to which it has been exposed.

"It has been stated by some, that the whole appearance of coal, as seen by the microscope, is that of woody tissue, and that the ashes of all coal show such remains. An extensive examination of coals, however, will show that they possess a structure essentially of their own kind; and when vegetable remains are found imbedded in the substance of the coal (as it frequently is without being at all apparent to the naked eye), such structure merely results from a portion of the original tissue remaining uncoalified amongst the mass. Such a condition is shown by three of your specimens—namely, in the Newbottle coal, in the Netherwitten coal, and in Pritchard's specimen. The jets represent still more imperfectly coalified vegetable matter than any form of coal, containing mere vegetable remains; and perhaps they are the best kind of coaly substance to show, by sections, the various transition states from vegetation to the completely transformed coal. Many coals contain much of the organic remains of vegetation. I send you Dr. Balfour's monograph on the Fordel coal, and also drawings from some sections of vegetable texture I obtained from the Torbanehill—namely, the scalariform tissue, and the yellow bodies described as the spores or minute seeds of ferns. There are also in many of your other sections, parts which show a uniform homogeneous appearance, as if the substance had become consolidated from being in a plastic or structureless fluid state. The Wallsend coal shows this, and also the Killingworth inferior coal.

"The South Hetton coal contains a very uniform mixture of the black and yellow matter, and a more homogeneous texture than any of the others. The splints are all stratified by laminæ of the black and earthy matter. The South Shields being almost black, with small elongated yellow cells. The Jarrow is also very black, with the spaces empty of yellow matter. In the cannel, or Parrot coal, we have the greatest variety in the colour and form of these spaces.

"I have made drawings from many of your specimens, all of which are in the hands of Dr. Richardson, or his printer.

"Permit me once more to express my best thanks to you for the kind manner in which you so generously offered me

the use of your specimens, which are indeed very fine, as the work of a much respected lapidary now dead; and I do not think any so fine are now made."

I cannot myself lay claim to any other than a very general acquaintance with Botany; but a long-continued acquaintance and friendship with some eminent cultivators of the science, as well as the occasional perusal and deep admiration of many of the works which, of late years, have so richly illustrated the subject, as also some collections of plants which I possess, have tended to impart interest to whatever researches of a local character have fallen in my way. Among these, I must mention the Supplement to the Flora of North Yorkshire, published last year, the contents of which appear to be highly creditable to the authors. From one of them, the son of an old and valued friend, I have been favoured with some memoranda relating to the progress of Botanical science, and to the distribution of plants, in the North of England. These latter relate more especially to what has been called Phytostatics, which forms a range of inquiry distinct from the more immediate conditions which are the proper objects of Botanical science. True it is, that before accurate observations can be made, as regards the locality or distribution of plants, a considerable acquaintance with Botany must be attained; yet, with this as an indispensable requisite, the question of distribution is one which particularly claims the attention of a Society of professed excursionists.

The following extracts are from a correspondence which I had with Mr. Baker respecting the locality of certain plants :—

"I find, on inquiry amongst others more learned than myself, that we have, in Northumberland, some of the species which you assign to Yorkshire, as a northern limit; as, for example (p. 15), *Lepidium latifolium*, at Tynemouth; also on Magnesian Limestone, at the same place, *Brassica oleracea*. *Medicago maculata* has been imported to Hebburn, on the shores of Tyne, in ballast. *Viscum album*, I am told, is abundant near Bradley, on the south banks of Tyne. *Carduus pratensis* is found in Winch's Flora of Northumberland and Durham. Wallis says he found at Kyloe, in the northern part of Northumberland,

Convallaria Polygonatum; and my valued Botanical friend, Mr. John Thompson, claims *Arundo Calamagrostis* for Ridley Hall, and its woody banks, thirty miles west of Newcastle, on the Tyne."

To these remarks Mr. Baker returned the following observations :—

"With reference to the species mentioned, Watson, the great authority upon this subject, does not admit your localities for *Brassica oleracea, Lepidium latifolium, Medicago maculata,* and *Viscum album,* as natural stations. Of the two former, my collection contains specimens from the place to which you make reference, given to me by my old school-fellow, G. S. Brady, of Gateshead. For *Carduus pratensis,* Winch mistook formerly *C. heterophyllus. Chlora perfoliata,* and *Arundo Calamagrostis,* are doubtless quite correct, but I suppose not published. The Botanists of Wallis's time frequently mistook for *Convallaria Polygonatum,* a form of the ordinary 'Solomon's Seal,' *C. multiflora;* but I observe, from the 'Terra Lindisfarnensis,' that the truth of his report has been lately confirmed by the Berwickshire Naturalists' Club. John Thompson, I know well enough by repute; and, indeed, have the pleasure of some slight personal acquaintance with him, as I once came in contact with him in Teesdale, and spent the evening in his company, at the High Force Inn, talking matters over about Winch, Robertson, &c.

"As regards British Botany, 1854 would seem to have been a year of fair progress, as regards discoveries. In flowering plants, perhaps the most interesting novelty is *Epipogium Gmelini,* a curious orchidaceous parasite (at least a plant which always grows upon decayed vegetable matter), previously known upon the Continent, from Scandinavia southward; of which a specimen or two were found in the summer at Tedston, Delamere, in Herefordshire. Then there is *Hierochloe borealis,* an Alpine grass, reported by Don, a long time ago, has been re-discovered in the vicinity of Thurso. The monthly periodical devoted principally to British Botany, the 'Phytologist,' was discontinued early in the year, owing to the decease of its editor, and has not yet been resumed, so that I do not know that these have been published

anywhere yet. *Salix acutifolia* (a willow, representing a group not known in this country before its discovery), was announced (by myself) as a British plant, and described in the February 'Phytologist.' It might be interesting, too, to tell the Club, that a *Galium*, which grows amongst the rocks below the White Force, Teesdale, is most likely a species not acknowledged as British. I have not yet been able to arrive at a definite conclusion about it; but when I showed specimens to Jordan, of Lyons (the great authority upon the genus*), he thought it was most likely the plant which he has described under the name of *Galium commutatum*. Your Club might investigate it next time they make an excursion in that direction.

"In Ferns, the third edition of Newman's History, a work admirable both as a popular and scientific history of our indigenous species, has made its appearance during the year, proposing various considerable alterations in nomenclature, and containing descriptions of several real or supposed species, which have been discovered since the publication of the second edition. This morning I received a prospectus—a work to represent the 'British Ferns by the nature-printing process, as practised at the Imperial printing office at Vienna'—to be edited by Moore and Professor Lindley, and to be completed in twelve or sixteen monthly parts.

"As regards Mosses, Wilson's long-expected work will doubtless appear very shortly. You may form an estimate of the progress which has been made in Bryology during the last few years, by the fact, that our work for Yorkshire (a single county alone), enumerates about the same number of species as the latest descriptive work—Sir W. Hooker's Flora—for the whole of Britain. There is though, as might naturally be expected, no other county that can nearly come up to ours in this respect.

"In Lichens, has been published Leighton's Monograph of the British *Graphideæ*, which contains exceedingly elaborate descriptions and drawings of the British representatives of the class, and proposes to arrange them under several genera, instead of one or two. In Yorkshire, Mr. Mudd, of Ayton (who was

* *Vide* Appendix to the Supl. Flor. Yorkshire.

gardener to my late uncle, T. Richardson), has just detected, in Cleveland, four species new to science; one *Biatora,* one *Verrucaria,* and two *Arthoniæ;* of which, if you like, I can send examples to mount, to show under the microscope at your meeting. Just before the 'Phytologist' stopped, I described *Evernia vulpina,* a tall-branched bright-yellow species, well known upon the Continent, from examples collected in Ireland; and a couple others, preserved as British, without special stations, in Dalton's collection, which I had through my hands during the early part of the year, to arrange for the Yorkshire Philosophical Society. *Hieracium* (a genus of composite plants, which, so far as flowers go, look not very unlike dandelions), is attracting a good deal of interest. A great Swedish botanist published, a few years ago, a general monograph of the genus; and it is found that our British *Hieracia* need a great deal of revision, and that the number of species which we possess is much greater than has been supposed. The Backhouses, of York, have taken great pains, during the last two or three years, to study them amongst the Scotch Highlands, Teesdale, &c., and will probably be writing upon them soon. Dr. Johnston and Mr. Embleton both kindly forwarded me their collections of specimens from the Cheviots; but I do not think that you possess anything in Northumberland that we have not in Yorkshire."

I prefer not to express an opinion on details as to any differences of opinion in regard to the precise distribution of certain species of plants in the North of England, because I am not sufficiently acquainted with the scientific minutiæ, by an exact knowledge of which such variations of opinion can alone be determined. I may however observe, that, as data for the resolution of any such questions, it is requisite that accurate maps should be prepared, showing not only the river basins, but also the general range of elevation above the level of the sea; and the map which accompanies the Supplement to the North Yorkshire Flora presents a clear and explanatory view of the several river basins of the district, the arrangement and colouring being remarkably distinct. I had hoped that the operations of the Ordnance Surveyors, which have recently been in progress in

this part of the kingdom, would have led to an early completion of the Ordnance Map of Northumberland; but I regret to hear that operations are to be suspended, and that a further delay of three years will take place before they are resumed. Until the series of levellings are completed and published, any approach to accuracy is nearly impossible in a district so varied in elevation as Northumberland; but, in the mean time, it may not be without use to consider the districts between the Tees and the Tweed as divisible into distinct regions for the purpose of Botanical divisions. With this view, I venture to suggest for consideration three zones of elevation—one embracing the extensive level lowlands near the coast, not exceeding 200 feet above the sea; another, all lands between 200 and 1,000 feet elevation; and a third, the more elevated moorlands, above 1,000 feet. These may be called the sea, middle, and mountain zones; and be subdivided into districts, comprising, first, The country lying between the River Tweed and north-west borders of the County of Northumberland, and a line of latitude extending between the Rivers Coquet and Wansbeck; another, between this line and a line between the Tyne and the Wear; the third, extending from the last-named summit to the River Tees (as sketched approximately on the small map, on which also are marked the several places hitherto visited by the Club). I have received from Capt. Cooke, who is now superintending the Ordnance Surveys in this district, several interesting details relating to the elevated region in which, as you are aware, much of my own time is passed; and I beg to say, that I will have much pleasure in facilitating, if I can, any attempts that may be made to investigate the Botanical species and localities of the moorland districts adjacent to the upper dales of the Rivers East and West Allen and the Wear.

It is unnecessary for me to advert, otherwise than in brief terms, to the interest and importance of the study of Natural History, or to the advantage, as well as pleasure, of pursuing it, by visiting different localities, within a reasonable limit, as regards the time which can conveniently be spared. Distance has become less an object accordingly as railway facilities are more or less presented. Your having joined this Society, is

itself a sufficiently marked recognition of the general principles on which the formation of this and similar Societies is based; nor need I say much of the extraordinary facilities which the town of Newcastle affords for excursions to the many remarkable localities to be found in the Counties of Northumberland and Durham, railways extending eastward in three several directions towards the coast, as well as north, west, and south. Combining, as we profess to do, the examination of objects of *antiquity*, as well as of *natural productions*, we possess in this town, as a centre of operations, extremely valuable Museums in both these departments; and interesting as are the Border towers, the ancient towns and villages, and the romantic scenery of these two counties, they are rendered still more deeply interesting by the great ability with which local histories of them have been compiled by Hodgson, and by Surtees; and the ardent love of nature which they possessed, was not unfrequently expressed in terms of truly poetical description. "What spot of earth is there," says Hodgson, "which has not something remarkable about it, to the eye and mind that have once become accustomed to examine everything in nature, or connected with the history of man Civilised man, wherever he goes, sees something to examine, something new to engage his attention, some rock, or mineral, or plant, or colony of microscopic creatures inhabiting that plant; trace of some temple, camp, or grave, that rendered them awful, or powerful, or sacred, in some age. While there are some who love to study the heavens, the laws and positions of the worlds, and systems of worlds that float in the immensity of space, there are others whose genius bends them to the less noble, but still interesting study, of reviewing, within the neighbourhoods in which they live, the evidences which God has written in the rocks, of the changes that our globe underwent in its progress to perfection; of tracing the hand of wisdom and goodness forming its surface and its soils to the infinite purposes to which they are adapted. What man is there, who, when he hears the place of his birth, and the hills and lands of his forefathers, made the subjects of history and inquiry, does not glory in them, and feel a love and veneration for them far above aught that the dull and

incurious people can imagine, who have no such recitals about the places in which they were born, or the fields that nurtured them? What is it, but this rational and virtuous pride for one's country, which is the flame and soul of patriotism?" These are considerations which, I trust, will never be lost sight of, as giving great inducements to continue the researches which are the express objects of this Club; and I would here take occasion to observe, that as the intermixture of such studies with the active professional and mercantile occupations of many of our Members is calculated to promote health, as well as mental improvement, it is much to be wished that a conviction of this would induce a greater number to join the excursions, and to follow out the objects of this Society on a systematic and more extended plan.

It appears to me that if a greater number of officers could be found, willing to act as Secretaries in two or three separate departments, the efficiency of our Club might be greatly increased. At present, a selection is made of six places to be visited, and suitable arrangements are made, and communicated by printed circulars to the Members, as to railway conveyance, the time and place of meeting, the dinner-hour, and so forth; but if it were possible, in addition to this, to have a more detailed programme—some brief references to county or other works, stating the general character of the local antiquities and scenery—the best modes of obtaining access thereto—the locality best suited for Botanical or Geological rambles, or Antiquarian research, and the co-operation, whenever possible, of one or more local guides,—these data and facilities would, I have no doubt, add much to the enjoyment of the Members, and induce many to join the excursions. To this I would propose a further addition, viz., that a printed form—a classified schedule of suggestive inquiries—should be given to all excursionists, who are willing to make memoranda of the results of their observations. By this means many isolated facts might be preserved, which now escape being recorded altogether. Many an observer takes notice of matters which he would willingly insert at the time, with all the freshness and accuracy of immediate observa-

tion, on a printed form, but which he would not afterwards deem worthy of a distinct communication to the President or Secretary. The holiday-like excursions of a few hours, are more adapted for such brief *jottings down*, than for elaborate notices; and I will be glad if the experiment could be tried for a year or two. As an illustration of my meaning, I will advert to arrangements which I had the pleasure of proposing, on two different occasions, when the Club visited Allenheads. One party went in quest of Botanical specimens; another explored the interior of the mines; and a third visited the out-door operations, and examined the general Geology of the district. Each party was placed under the guidance of a conductor acquainted with the localities, and with the objects most worthy of observation in these several departments. Now, in every district, a similar subdivision of labour may be, and frequently, in practice, is made; but, for want of preconcerted arrangement, and fitting guides, not only is much time lost during the excursion, but many Members are unaware of the special attractions which deserve their notice. In many parts of these Northern Counties, we have not only historical, but geological antiquities, deserving close attention; and among the latter, few are more remarkable than the evidences of geological changes presented by apparent remains of glacial action. A large specimen of mountain limestone,* which was placed in this building in 1842, at the joint expense of Dr. Buckland and myself, exhibits very clearly the grooved and furrowed marks so frequently found in positions where the hardness of the rock has sufficed to preserve these records of the passage of vast masses of ice. The investigations of science, which thus extend to vastly remote periods of time, are now also actively directed to chemical researches into the composition and economic uses of rocks and soils. With reference to these, and indeed to all studies connected with Natural

* This specimen was brought from a deep excavation, near the New Quay, at North Shields, made in forming a new road from the New Quay to the Railway Station. Its surface is polished, and marked with groovings exactly resembling the rocks worn and polished by glaciers in Switzerland, and are dissimilar to any effects usually produced by water. Its dimensions are 5 feet by 4 feet, about 1½ feet thick, and weighs about 1½ tons.

History, it is impossible not to recognise the value of good collections of specimens, and convenient opportunities for observing them. The formation of Museums, for popular instruction, has lately occupied, and will, it is trusted, continue to occupy, the attention of Government. In vain, however, would the statesman endeavour to diffuse such advantages unless aided by active and intelligent local co-operation ; and here it is, that Societies like the present may be of great use, by guiding the public mind in a right direction towards a scientific development of whatever, in such matters, tends to gratify and instruct. In the formation of Museums, large apartments, and architectural decoration, too frequently receive an undue share of attention, whereas a number of rooms, of moderate size, are better adapted for classification and study. I was much impressed with this on a recent view of the Museum at Copenhagen, containing the sculptured works of Thorwalsden. On the ground-floor are spacious halls for equestrian and other large statues ; but by far the greater part of the collection is arranged in thirty-five separate rooms, of moderate size, where, by a due classification, the attention is concentrated on the particular objects therein contained. This condition is much more favourable for study than when the eye and mind are distracted by a blaze of light, and a multitude of objects. In this manner, it is obvious that a Museum may be commenced on a moderate scale, and at a small cost, admitting, from time to time, of enlargement, as space and funds may allow, in order to accommodate an increasing collection. The same excellent plan is adopted in the Museums of Ethnology and Antiquities, at Copenhagen, under the admirable management of Professor Thomsen. Here, in separate rooms, are arranged distinct illustrations of different nations ; and it is truly gratifying to observe the close attention with which the numerous visitors study the contents, assisted at times by, and delighted with, the kind and cheerful explanations given by Thomsen himself. The time and talents of this accomplished Naturalist are unceasingly devoted to two objects—one to collect and arrange useful and curious collections, the other to render them accessible to, and thoroughly understood by, the public. During the few

hours spent in these Museums, I observed him, at one time, making appointments with royal personages; at another, familiarly explaining coins and other antiquities to peasants. In this manner, his own personal efforts have done much to extend a useful knowledge of works connected with national events, as well as with the more ample and wondrous realms of Natural History. It is in this direction, I consider, that the Members of our Society, and similar institutions, might do good service, both in local Museums, and when occupied in country excursions. In the latter, I would especially mention how much benefit might arise from occasional visits to, and short lectures in, schools. The foundation of a love of natural knowledge might be thus implanted in many a mind, and teachers would be encouraged to persevere in the development of that knowledge of common things which is now so properly deemed an important part of popular education.

Natural History presents so many attractive objects of study—unfolds so many wonders—opens out so many interesting modes of employing time, and so eminently improves the powers of observation, that it has a direct bearing upon all education, and cannot, therefore, be too earnestly impressed on the young. How few and far between are the opportunities presented to the children of the humbler, or even of the middle and higher classes of society, of studying, at leisure, any well arranged and self-explaining collections. Museums arranged in separate rooms, of moderate size, and without pretensions to architectural show, ought to be open to the public in every town, and any considerable village; and as regards this town, I cannot avoid alluding to a collection of great value, which it is to be hoped may, at no distant time, be placed in a convenient suite of apartments, and made available for public inspection. I mean the admirable Ornithological Museum, formed by one of our members, Mr. John Hancock—a collection which, I am warranted in saying, is of national value, and ought therefore, locally, to be highly prized. In some minds, a keenly perceptive power of observation has been combined with skill in manipulation, and with almost unwearying powers of application. The union of these rare, but

most precious gifts, is strongly exemplified in the formation of the collection to which I now advert; and it is certainly worthy of the attention of this Society, and of every lover of Natural History, to consider how it can be made available for more extensive and permanent use. I venture to make this allusion to a private collection, without any previous concert with its much esteemed possessor, because I am well aware that the opinion of the very best authorities has stamped it with a character of exactness, which, I would almost say, gives the public a reasonable claim to expect ample facilities of deriving instruction and amusement from its study. I need only, in the briefest terms, allude to the extreme beauty and expressive character of this, I believe, nearly perfect collection of British Ornithology; and I feel confident that the opinion I thus express will meet with the entire approval of all who have had any opportunity of appreciating its excellence.

The numerous Horticultural Societies which have, of late years, been formed, are gratifying proofs of an increasing taste for the attractive and ornamental departments of Botanical Science; and I may mention, that by giving small prizes to young children for collecting wild flowers and mosses, the Naturalist may obtain specimens which would otherwise escape observation. I have made this experiment for several years with great success, and would strongly recommend it to others.

With reference to this subject, I may also say, that, by a series of good Botanical diagrams, an early taste for, and knowledge of Botany, may be instilled generally into the minds of children. Several years ago, I was surprised and gratified to find, in a school of upwards of six hundred children, in Edinburgh—nearly all of them the children of poor persons—a very considerable knowledge, not only of the terms, but of many of the useful applications of Botanical Science. The master showed me a roll of coloured drawings, upwards of thirty feet in length, the frequent inspection and explanation of which rendered them familiar with so much detail as to lay a fair foundation for further study; and I have adopted a method, which I think even superior to the above for use in schools—viz., by inserting, on

separate sheets of paper, the actual specimens of the various parts of the plants themselves—as, for example, the roots, stems, leaves, &c.; and, in another collection, I have placed mounted specimens of the Summer and Autumn leaves of the principal varieties of British trees. It is obvious that, for drawing, no better models can exist; and this department of art, so useful to the student in Natural History, is now, with great advantage, introduced in many schools as a useful part of ordinary education.

The Geological Model placed on the table, and to which I have already alluded, has been prepared, not only to illustrate some curious data relating to the position of coal mines in the district between this town and Carlisle, but also as an example of a cheap and expressive form for conveying such information generally. It is constructed to a scale; and its several parts are made so as to show, first, the original level, or nearly level deposition of the strata; next, the gradual upheaval, by which the rocks of this part of England are inclined so as to rise from the eastern coast to a considerable elevation, in the middle part of the island; thirdly, the dislocation of these strata by the Tynedale fault; and finally, the denudation of the surface, and consequent distribution of beds of workable coal. Models of this description are better adapted for conveying information than any plans, sections, or descriptions, or even than by an inspection of a large district, inasmuch as the varied surface and subterranean phenomena, when represented by a model, may be combined in a small space, and seen at a single glance.

In adverting to recent researches connected with Natural History, I cannot but make some reference to the serious loss which the world of science has sustained, in the death of Professor Edward Forbes and Sir Henry De la Beche. The former had already attained an honourable position, and appeared destined to gain the very highest ranks of scientific distinction. His premature death, which has been deeply regretted by every Naturalist, has been still more acutely felt by all who, in addition to their admiration of his talents, were charmed by the vivacity, and delighted with the rare union of the estimable qualities which endeared him to those who had the privilege of his friend-

ship. His rapid progress was encouraging, and may be considered as one of the sure marks of an increasing public regard for intellectual merit. I recollect being present at a meeting of the Geological Society of London, when he spoke for the first time, prior to his being appointed to the office of Curator. A few sentences were expressed with so much clearness, and with such a natural and winning eloquence, that they seemed at once to indicate a marked superiority of mind, and to promise the maturity which, short as his life has been, was fully attained. He became President of that Society, and, it was hoped, was about to proceed in a long career of usefulness in Edinburgh. He had already taken active measures for greatly extending, in that University, the means of public instruction, and extended opportunities of observing the contents of Museums; and I feel satisfied that, in expressing sincere regret for his loss, I express the feeling of every student and every lover of Natural History.

Of Sir Henry de la Beche, I am desirous to make some mention at greater length, inasmuch as his efforts were constantly and zealously bestowed on objects which are of peculiar interest to this district; and a short review of them may be useful now, when attention is directed to the formation of Mining Schools, of public Museums, and to improved education generally. Twenty-five years have elapsed since Sir Henry, then Mr. de la Beche, *drew, lithographed,* and published his "Sections and Views Illustrative of Geological Phenomena." Of that work, strange to say, only two hundred copies were printed. In a conversation which I had with him only a few weeks before his death, this was adverted to; and it is, I believe, strictly correct to say, that this collection of sections and views has been, not only one of the earliest, but one of the very best and clearest of the numerous illustrations of Geology which have appeared in the last quarter of a century. To Sir Henry de la Beche belongs the great honour of having founded what has now become a national establishment—the Museum of Practical Geology; and one arrangement which he specially provided in that institution merits particular notice—viz., the delivery of lectures to working men. Those who had an opportunity of knowing, as I did, the almost insuperable

difficulties which he surmounted by admirable tact and never-failing energy, were impressed with the conviction of his great merits; and I may here observe, that the qualities of his mind were such as to deserve not only close attention, but careful imitation. His train of study, and habits of observation, appear to have been marshalled into order by military studies in early life. Thence he became rigidly careful as to the objects to be selected for pursuit; but, having once selected, he seemed *incapable of failure.* Commencing with small beginnings, and most humble aims, he gained the acquiescence which would have been denied to broader requests; and having once gained a footing, his clear and accurate mind so distinctly demonstrated the advantage of further progress, that refusal was impossible; and thus, step by step, year after year, he went on, until he accomplished results which must yield imperishable honour to his memory. To him the nation owes the splendid mansion, erected at a cost of £30,000, in which, for the first time, the Government of this country has supplied purely technical and scientific instruction. He collected, first, a few specimens of rocks and minerals, in a room or two, in Craig's Court. These have been augmented into a National Museum! He directed, with great skill and perseverance, the Geological survey of the kingdom, and established a sort of Mining University, in which he gathered together some of the ablest and most animated friends and students of Geological and Mining Science. I have, in a former part of this address, alluded to his labours in the Building Stone Commission; and I have the satisfaction to add, that the preservation of Mining records was, a short time previous to his death, placed on a permanent and satisfactory footing. His literary works are too well known to require comment; but depending, as these Northern Counties do, on mineral treasures, for much of their past, present, and prospective prosperity, I feel justified in commending, with all the earnestness I can, the valuable labours of Sir Henry de la Beche. I do so the more willingly, as any reference to them is associated with a genuine regard which I ever entertained for his friendship. It enabled me, for many years, to be a witness of his exertions, and at times, in some humble degree, a fellow-

labourer, in efforts directed to the advancement of education, and the improvement of mining skill and industry.

On a review of the present state of, and probable improvements in, the means of studying Natural History, it is impossible not to observe many indications of rapid progress, and of greatly increased facilities, by which an accurate knowledge of details may be conveyed to the public. Thus, for example, what is called Nature-Printing, is becoming extensively useful in this direction; and a work on British Ferns, now in course of publication, is an admirable example of such application, the several varieties of these beautiful plants being shown with life-like accuracy. Photography also bids fair to become a useful aid; and it would be a great addition to the interest of our excursions, if skilful photographers would accompany our Members, and preserve pictorial records of the chief objects of interest.

The study of Meteorology is also becoming more general; and all who are disposed to unite in making accurate observations may, by joining the Meteorological Society of London, obtain properly adjusted instruments at a very moderate cost. In most places exact observations of the weather, rain-fall, &c., may be found of great value. The farmer is especially interested in every reasonable *prospective indication* of the weather; and the supply of water to towns, and for engineering purposes, can only be properly estimated by means of careful observations. Several of the mines under my direction are worked by water power; and I have, for some time past, had exact daily records made of the fall of rain. The variation of rain-fall in Great Britain is considerable, mostly ranging between 25 inches, in the eastern parts of the island, to upwards of 100 inches in the western and mountainous districts. Allenheads occupies nearly a central position, both as regards the length and breadth of the Island of Great Britain, and also in midway elevation between the low plains, which scarcely exceed the sea level, and the extreme mountain summits of Scotland and Wales. It is, therefore, favourably situated for observation; and as regards the amount of rain-fall, is found to present an average varying from about 50 to 70 inches.

Correct observations have been established at Bywell, in addition to those at Allenheads. The difference of elevation above the sea-level of these two places is 1311 feet; the former being 50 feet, the latter 1360 feet above mean sea-level. As these places are within a horizontal range of less than twenty miles, it is curious to observe the comparative states of the weather in the sheltered vale of Tyne, and the mountainous moors of Allenheads; and in order to present a clear view of this, I have had a diagram engraved to accompany this address. The range of barometer and thermometer, together with the rain-fall at both places, is shown in the depth of last winter, viz., in the months of December, 1854, and January, 1855. The uniformity of the barometric curves is remarkable; and it will be observed how nearly the *minimum* temperature of Bywell corresponds to the *maximum* of Allenheads. A black shade indicates the quantity of rain or snow which fell daily at Bywell, and a lighter shade represents the like conditions at Allenheads. I am not aware that any accurate comparison has hitherto been published of Meteorological phenomena, at so great a vertical range; and this, I trust, may be a sufficient apology for requesting the Members of this Society to accept this addition to the observations which I have now the honour to bring before them. It was my wish also to engrave the smaller map placed on the table, showing Sea, Middle, and Mountain *zones of elevation;* but the data for determining exact heights are so incomplete, that nothing but a mere approximation could be attempted. This, for any practical purpose, would be so defective, that I recommend the construction of a map, to be deferred until further progress of the Ordnance Geological Survey.

In the progress of that great national work—the accurate *horizontal survey* and *vertical admeasurement* of Great Britain, under the direction of the Board of Ordnance—many of the Members of this Society are much interested, and it is indeed, generally, a matter of public concern. It is with regret, therefore, that I learn from high authority, that a delay of three years is likely to take place before the survey of Northumberland is placed in full activity. I was lately honoured by a communica-

tion from the Treasury, inviting opinions as to the scale of the maps, and the system of contouring; and upon both these matters I submitted views, which, I venture to believe, would not only greatly facilitate the progress of the maps, but render them more extensively useful than can be accomplished by any other means. I consider the earliest possible completion and publication of a *one-inch map*, with occasional heights marked on it, to be all that either the public, engineers, or scientific persons require. A careful record of the measured lines of large triangles, or other spaces, might be kept in MS. plans and books, so as to be available to all who require maps on a larger scale; and, with boundary-lines, surrounding spaces of two, three, or more square miles, a correct guide would be had to such further surveying operations as are requisite to fill up the included spaces, which might be done to a greater or less scale, as parties desired for their respective purposes. *An index* of the lines thus measured, would then be the only publication required of Government, in addition to the one-inch map. If the sections taken of such lines were also made available, they would form a more exact guide than any extensive system of published contoured lines. At present, I regret that the publication of a correct map of Northumberland is further distant than I hoped. Whenever it is accomplished, it will be found of great value, as all existing maps of the county are extremely inaccurate.

I must now bring to a close this brief and imperfect review of the operations of our Society during the past year, and of collateral circumstances connected with the objects for which we are associated. The study of Natural History will, I trust, be found worthy of increased attention in schools, and in general society. The abundance of excellent books, at extremely moderate prices, gives facilities for study such as never before existed. The Society of Arts, in London, is making efforts, with great activity and earnestness, to promote the collection and study of all useful products; and the Trade Museums in progress of formation, under the immediate aid and auspices of that Society, are worthy examples of what may and ought to be attempted in the towns and villages of our Northern Counties. The occasional study of

some department of Antiquity, or of Natural History, would be found a gratifying relaxation from the almost incessant toils of business in which many of our Members, and other friends and neighbours, are engaged; and it is impossible for a well disposed and healthy mind not to derive great benefit from occasional country excursions, the objects which present themselves tending to impress a deep sense of the infinite goodness, as well as greatness, of the Creator. Considerations, such as these, impart dignity to science. A sense of devotion becomes necessarily blended with accurate habits of observation; and the observer who attentively considers the lilies of the field, is inevitably led to consider the right direction of higher efforts tending to promote the glory of God, and the good of man's estate.

I have now, once more, to thank you for what I have considered an unmerited honour. I have been gratified by renewed opportunities of enjoying the friendship and companionship of many estimable friends. I rejoice in any opportunity of expressing my humble, but sincere interest in the progress of science; and I now resign the chair in which your kindness has placed me, indulging the hope that you may long continue to promote the benefits, and enjoy the pleasures which attend the Summer rambles of the Field Naturalist.

The undermentioned gentlemen were this day elected Members of the Club:—Rev. George Sowden, Newbottle; Messrs George Cooper, H. T. Mennell, and Thomas Pattison, jun., Newcastle; and Henry Atkinson, Gateshead.

DAYS AND PLACES FOR THE FIELD MEETINGS THIS YEAR.

MONDAY, *June* 11*th*, ...Bothal.
FRIDAY, *June* 29*th*, ...Rowland's Gill.
TUESDAY, *July* 24*th*, ...Chillingham.
TUESDAY, *August* 21*st*, ...Wallington.
WEDNESDAY, *September* 12*th*, ...Prestwick Car.
TUESDAY, *October* 2*d*, ...Hartley Burn.

The following gentlemen were elected office-bearers for the year ending February, 1856 :—

PRESIDENT.

Rowland Burdon, Esq.

VICE-PRESIDENTS.

Sir W. C. Trevelyan, Bart.
W. Kell, F.S.A.
Dennis Embleton, M.D.
Joshua Alder.
Ralph Carr.
Thomas Sopwith, F.R.S., F.G.S.

SECRETARIES.

John Storey, F.B.S.E.
Edw. Mather.

TREASURER.

Joseph Blacklock.

COMMITTEE.

Rev. G. C. Abbes, B.A.
Albany Hancock.
T. J. Bold.
John Thompson.
George Wailes.
Daniel Oliver, jun., F.L.S.
Richd. Howse, jun.
R. Y. Green.
F. J. Peck.
Thomas Austen.
Joseph Swan.
L. M. Cockcroft.

I.—*Description of* LATHROBIUM CARINATUM,* *an apparently undescribed British Coleopterous Insect.* By THOS. JOHN BOLD.

[Read at the Field Meeting, held at Alnwick, August 31st, 1854.]

FAMILY—STAPHYLINIDÆ.

Lathrobium.

L. CARINATUM, *Bold.*

Zoologist, p. 4483.—*Entomologists' Annual*, 1855, p. 91, fig. 6.—*Id.*, Second Edition, 1855, p. 123, fig. 6.

Deep jet black, very glossy, sparingly clothed with griseous pubescence.

Head large, fully one-third wider than the thorax, orbicular, depressed, closely and very distinctly punctured, with an impression a little before the vertex in front; labrum rufous, fringed with golden hair; mandibles long, curved, prominent, rufous, black on the outer edges, and at the tip; antennæ elongate, as long or longer than the head and thorax together, graceful, rufous; the basal joint with a dusky annulation; palpi also rufous.

Thorax narrow, elongate oval, much depressed, coarsely punctulated, with a distinctly elevated central carina, which is exceedingly smooth and glossy.

Scutellum obtusely triangular, punctulated.

Elytra bright blood-red, black for one-third the length at the base, distinctly punctulate, somewhat wider than the thorax, parallel, depressed; the suture elevated, with a stria on each side.

Abdomen depressed, strongly margined, very finely punctured, the antepenultimate segment narrowly edged with white, the last sparingly covered by stout black diverging hairs.

Beneath finely punctured and pubescent, black.

Legs elongate, black, the trochanters rufo-brunneous; the apices of the tibia and the tarsi rufous, and covered with aureous pubescence.

* In a paper communicated to the Entomological Society of London, March 5, 1855, Dr. Schaum refers this species to *L. angusticalle*, Boisd. and Lacord., but as I think his opinion is formed on insufficient grounds, I retain the name by which I have designated it.—T. J. B.

Male, with the fifth segment beneath sinuated; the sixth canaliculate.

Female, with the penultimate segment beneath a little produced and rounded; length 3—3½ lines.

This very distinct insect is certainly the most beautiful of its genus, the bright blood-red of its elytra contrasting strongly with the shining black of its body; whilst the large orbicular head, narrow carinated thorax, elongate antennæ and legs, give it quite the appearance of a *Stilicus*.

It would appear to be very rare, two specimens only having come beneath my notice; one, a male, I took amongst gravel, near the river Irthing, Cumberland, in June, 1847; the other, a fine female, was captured in a similar locality, on the Devil's-water, Northumberland, by Geo. Wailes, Esq., at the Club's Field Meeting, in May last.

THOMAS JOHN BOLD.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ, AT THE TENTH ANNIVERSARY MEETING, HELD ON THURSDAY, THE 15TH MAY, 1856. BY ROWLAND BURDON, ESQ., PRESIDENT.

GENTLEMEN—I have to express my sincere regret at my unavoidable absence from the meetings of the Society which has conferred on me the honourable position, entailing the present duty of recording its proceedings for the past year.

The successful action of the Society must of itself have a constant tendency to exhaust the topics for description, and render new discoveries rare and difficult; and thus, although excursions will continue as gratifying as ever, and though the study of nature is inexhaustible, presidential addresses and notes of members will probably become

"Small by degrees, and beautifully less."

In this instance, the notes handed to me for incorporation in this address are not ample as to some of the meetings, owing partly to the weather; and I regret that my own absence does not enable me to supply the deficiency. My consciousness of not possessing either the special or general knowledge which would enable me to communicate any matter of scientific interest, caused me to ask the advice of a member, who, desirous to oblige an unworthy President, suggested that I might address you on the subject of Reformatory Schools. With every respect for the opinion of my counsellor, to whom I believe the Society is deeply indebted, and although I feel great interest in the subject, I cannot recognise any peculiar relation between it and and this Society. There is, however, one reform—one species of theft with which the Society is concerned, and on which I may be permitted to say a few words—I allude to the stealing of plants, about which I can speak feelingly, as Castle Eden Dene is peculiarly subject to depredations of this sort. Persons really fond of the science of Botany are not likely to be guilty of it, and this Society has an express rule against it; yet I must say that rules

are not always read, and even Botanists have appeared with an array of implements calculated to cause at least a suspicion of felonious intentions. There are large tins and curious knives, which may, no doubt, contain sandwiches, or be employed for festive purposes. To use language which savours of the shop, I suppose we must give them the benefit of the doubt, and take an acquittal. But fashion as well as science has lately commenced a crusade against a most innocent tribe of plants—the ferns; and many hundreds of the thousands who visit the dene annually plunder it of those rare and beautiful inmates. There are or were sixteen different species of ferns in the dene, which are not likely long to survive the constant inroads of these moss-troopers. The *Lady's Slipper* is now so nearly extinct, that I vainly endeavoured to exhibit a native specimen of it to the Society when they last visited the dene. The *Epipactis ensifolia*, the *Pyrola rotundifolia*, the *Fly Orchis* and *Bird's-nest Orchis*, have all been frequently taken up, and none are likely to survive long in a garden; nor are any of them so numerous as not to run the risk of extirpation. I must appeal to the Society to support me in the prevention of the offence of tearing plants from their native habitats, where alone they flourish and delight the scientific observer, and placing them to wither in gardens, or pine on rockwork, or under glass-shades.

In the enumeration of the duties of a President, I find that he is to suggest subjects of interest. In this respect, as in others, I feel that the field has been so thoroughly harvested that little remains to be gleaned. Former Presidents have—or my ignorance makes me think they have—left little to suggest. There is, however, one subject, which, if it comes within the scope of the Society, and if there are the means of prosecuting the inquiry, would, I think, be interesting. I mean, inquiry into the actual condition of the inhabitants of our Northern Counties, especially the labouring classes, as contrasted with its state in former and remote periods. A few papers, containing the result of thorough and careful investigation, might convey much that is generally unknown, and might possibly even elicit new discoveries. I know not whether this is practicable, but if it be so, it is cer-

tainly fraught with the deepest interest. History has generally been silent on the condition of the great masses of society, or only discloses it by incidental touches. This silence is, no doubt, in the first place, due to the fact that there is not much to record, nor much which strikes the imagination in the tame and humble course of ordinary life. The poor may say, like the knife-grinder—"Story! God bless you, I have none to tell, sir."

> "With silent course, which no loud storms annoy,
> Glides the smooth current of domestic joy;"

and the voice of misery has been equally mute and unheard from the depth where it has been uttered. But it is also partly owing to the feeling, which showed itself in the doctrine, that the people were made for those who governed them, and which, descending through the different stages of society, always supposed the relative insignificance of the lower class to that above it. We have, at last, begun to appreciate the vast importance of a class which has, for ages, been thought unworthy of the notice of history; and this Society has especially recognised it, as it was formed with the hope of forming a new bond of union between all classes, and its subscriptions were purposely adapted to that object.

Without concurring in the fanciful opinion of some philosophers, that all animated beings are to be regarded "as a series of advances of the principle of development, which have depended upon external circumstances, to which the resulting animals are appropriate," I cannot help thinking that something analogous occurs in human societies.

It would be curious to trace the change from the feudal lord to the modern squire, and to see how the fangs and tusks have been reduced—possibly the tail lost—and the whole animal softened to a milder type, with little of the original fierceness left, except what relates to game laws.

It might be well, in attempting to pourtray scenes of former times, to lay down, first, as the basis of comparison, an accurate description of the same class at present, as, in surveying a country, some levels must first be accurately ascertained to start from. Nor is this so simple and easy a matter, as it might seem

to be at first sight, as such descriptions are very liable to error from fancy and prejudice, and there is always a strong temptation to add to the interest of a humble subject by exaggeration.

An instance of the difficulty of arriving at truth in such matters, may be found in the conflicting opinions about the condition of labourers in the north of Northumberland. The late benevolent Vicar of Norham, and the resident farmers, would certainly have described it very differently. In the absence of such accurate descriptions, our great historian, Macaulay, has been obliged to have recourse to novels and farces for his sketches of different periods of society, and has thus transferred to his canvass, features manifestly caricatured and overdrawn, and possibly has accepted the creations of fancy and humour for faithful delineations of nature.

I have now to record the proceedings at the meetings of the Society.

The First Field Meeting was held on the 11th of June, by the invitation of the Rev. Henry Hopwood, at Bothal and Sheepwash. The party from Newcastle, on alighting at Morpeth, were joined by several members, and proceeded on foot by the banks of the Wansbeck to Bothal and thence to Sheepwash, examining on their way the various objects of interest which came under their notice. On reaching Sheepwash, they met with a courteous reception from the Rev. Henry Hopwood; and after luncheon, assembled in the Rectory Gardens, when Mr. Sidney Gibson read a paper on the History of the Church, Castle, and Barony of Bothal. He stated that the Church of Bothal is interesting as a specimen of the effect of border warfare on Ecclesiastical Architecture, as it has the square-headed trefoiled arch, common in castellated buildings, and a campanile instead of a tower, from the castle being adjacent. He expressed regret at the ruinous state of the castle, as compared with its former strength and magnitude; but although this feeling is natural to imaginative minds, I may be allowed to doubt whether a castle is not even more beautiful and interesting in ruins, and whether the rural calm which has succeeded to its warlike splendours is not suggestive of nobler as well as happier associations, than its semi-savage period of feudal power.

I must confess, even at the risk of exciting the anger or compassion of members of the Natural History Society, that I cannot regret the extirpation of wolves and boars from our fauna, nor of feudal chieftains and moss-troopers from our borders. All would, however, probably agree with Mr. Gibson, in thinking that the whole locality is suggestive of feudal memories, and invested with a picturesque beauty and interest, which can hardly be exceeded in any of the river valleys of Northumberland.

Mr. J. T. Bold exhibited a series of specimens of one of our wild Bees, and its parasite, the latter (*Nomada borealis*), he remarked, has hitherto been regarded as a very rare British species. Two other insects were also shown, and were noted as additions to our catalogue of Water Beetles, having been taken by Mr. Bold at Prestwick Car. Mr. Bold mentioned that he had seen a Pied Fly-catcher in the vicinity of Newcastle, and concluded by intimating that he was collecting materials for a catalogue of the *Aculeata*.

Mr. Storey laid before the meeting, specimens of the Mountain Melic Grass (*Melica nutans*), which he had found during the day, and which species, he stated, was new to the locality.

Nine gentlemen were elected members of the Society.

The Second Field Meeting was held at Rowland's Gill, near the Scotswood Station of the Railway, on Friday, the 29th of June, but no account of the proceedings of that day has been sent to the Secretary, further than that Mr. Charles Wilson, of Bishop Wearmouth, was elected a member of the Club.

The Third Meeting was held at Chillingham, on the 24th of July. The following account of it is derived from one contributed by Mr. W. H. Hills. The party from Newcastle, left Alnwick by the Wooler omnibus, to East Lilburn, not far from the Field of Flodden. The whole country, instead of being barren and desolate, despoiled by the reivers of border times, is laid out almost like a garden in its luxuriant fertility. The dark Flodden of the poet cannot be recognised in the quiet meadows, where peasant children

> "Rest them by the hazel bush,
> And plait their garlands fair;
> Nor dream they sit upon the grave
> That holds the bones of Marmion brave."

Passing through these border lands, they reached East Lilburn, where they were met by Mr. Langlands, whose residence lies at the foot of Bewick Hill, and who kindly accompanied the party for the purpose of inspecting the Celtic camp and inscribed stones on the summit of the eminence. Similar, but not as is believed so remarkable remains, are found on most of the neighbouring hills. The entrenchments consist of two semicircular enclosures, each with a double foss and vallum, and both surrounded by an outer wall of considerable length. The entrances to them are from the south—that in the centre of the two semicircles having apparently been the principal one. At this point is placed a round stone, which seems to have been the base of a pillar. Within the inner walls are circular buildings, fallen and broken through the lapse of time, which have evidently been the dwellings of the Scandinavian or Druidical inhabitants.

The two stones on which the inscriptions are carved are somewhat apart from the entrenchments, and may have been used in Druidical ceremonies. There is also a stone trough for water, which still exhibits marks of the tool with which it has been hollowed out. There are breaks in the walls of the enclosures, as though the stones had been removed for other purposes; and there are three walls meeting in one point, and each diverging from one of the inmost circular entrenchments, which seem not to have belonged to the original structure. Some of the party hazarded the conjecture, that these date from a comparatively modern period, when the neighbouring hill of Yeavering was a manor of the Saxon Kings.

Bede calls this royal demesne Ad-Gebrim, and says that King Edwin and his Queen Ethelburga resided there for thirty-six days after their conversion to the Christian faith, by the preaching of Paulinus, who attended them hither and converted great numbers of the Northumbrians, who were baptized in the neighbouring river. There is an extensive prospect from the top of Bewick Hill, and the scene is beautiful as the uplands rise above one another till they terminate in the noble range of the Cheviots. Immediately before the eye rise the hills of Brankston and Flodden, the two eminences sacred of old to Thor, and still bearing

his name. The Akeld and Humbledon Hills, and Yeavering Bell Red Riggs, the field of battle of Humbledon Hill, are also visible.

The party, descending Bewick Hill to the north-west, came to the ruins of an old church, one of the most interesting architectural remains in the North of England. Mr. Hardwick is of opinion that the nave and chancel date about 1100, but that the apse is earlier. He infers this from its being an independent building, and from the character of the windows, on the external jambs of which is worked a small rebate, peculiar to genuine Saxon remains. The plan of the church is Romanesque, and the chancel a good specimen of the plain Norman. The cap of the north pier is similarly ornamented to some in the crypt of the Castle at Durham. On the south side a window has been inserted about the time of Edward II., and two buttresses have been added to the external face of the apse about the same period. It may be conjectured that the Saxon apse may be referred to the same date as the works named before at Bewick Hill. What is known of the early history of this chapel is, that it was granted to Tinmouth by Matilda, daughter of Malcolm, King of Scotland, and first wife of our Henry I., about 1107. It was probably rebuilt then by the monks.

The party then proceeded to Chillingham, where, through the hospitality of Lord Ossulston, lunch was provided in the dining-hall.

In the Church of Chillingham, they examined the monument of Sir Ralph and Lady Elizabeth Grey. "This splendid memorial," says Raine, "has no compeer in the North of England, save the magnificent tomb of Neville of Staindrop." The details of the tomb are most rich and elaborate.

After examining all objects of interest in the Castle, not forgetting its dark and narrow dungeon, the party set out to view the famous wild cattle in the park, the genuine remains of the original race. Nothing is known of the period at which they were brought to Chillingham, but tradition says that they were taken from the Highlands of Scotland.

From the park they returned to Mr. Langlands' residence, where they were entertained with hearty hospitality, and returned

to Alnwick, in the evening, after a day spent amid delightful scenery, fraught with most interesting historical associations.

Nine new members were elected.

The Fourth Field Meeting was to have been held at Wallington, on the 8th of August, but did not take place from the unpropitious state of the weather.

The Fifth Meeting was held at Prestwick Car, on the 4th of September. Only five members were present. Mr. Bold procured several fine specimens of water beetles; but nothing new was noticed by the Botanists.

One member was elected.

The Sixth Meeting was held at Hartley Burn, near Lambley, on the 2nd of October. The following account is from the notes of Mr. John Thompson. The party, consisting of only four, went from Haltwhistle by the Alston Branch of the Railway to Lambley, which is an interesting locality for the Geologist. It presented an unexpected scene of great activity in coal pits and steam engines. The collieries stretch westward from Lambley, and lie on the north side of the great dyke which crosses Northumberland from the East Coast to Newbiggin on the border of Cumberland, and is known in the East by the name of the Ninety Fathom Dyke, but in the West by that of Stublick Dyke. The Hartley Burn has two branches—the left is called Blackburn, the right Roachburn. The party resolved to examine the Blackburn, which abounds in basaltic precipices; the water, after running through a deep and narrow channel, is thrown over a columnar brae in a succession of falls. The basaltic columns below, rise to a great height; and further down, where the stream crosses the dyke, the strata are broken and dip at every angle, and are also intersected by veins of basalt. The diluvium is a bed of reddish, clayey gravel, in which are embedded nodules of new red sandstone, masses of granite, and other products of the country, to the west and north-west. The party spent some time in the examination of this interesting spot, and were much gratified with the excursion.

The Evening Meetings were held, as usual, at the Literary and Philosophical Rooms, and were well attended. At the Sixth,

a paper was read by Mr. R. Carr, "On the Effects of the Severe Winter of 1854-5 on Evergreen Vegetation in the North of England;" and one by Mr. Oliver, "On the Growth in Diameter of Dicotyledonous Stems." A paper was read at the Seventh Evening Meeting by Mr. J. Hogg, "On the Salmonidæ and the Chance of re-peopling the Northern Rivers by their Artificial Propagation."

While I have to congratulate the Society on its flourishing condition, and the increased number of its members, I have also to deplore the loss to it and to science of one of its oldest and most valued associates, Mr. Fryer, of whom the following notice, communicated by Mr. W. Hutton, will be read with interest:—"Joseph Harrison Fryer died on Christmas Day, 1855 (his birthday), aged 77. In the year 1826, Mr. Fryer went to South America, to take charge of one of the magnificent projects for mining the precious metals. The Company was a failure; but he remained in the country for three years, where he turned his knowledge of Natural History to good account. It was at this period the Shells of South America first attracted the attention of Naturalists, and Mr. Fryer was one of the earliest, if not the first, discoverer of several species since well known. With the stores he collected he returned to England in 1829, and became an active promoter of the Natural History Society, and was an early member of this Society of the Tyneside Field Naturalists."

The following gentlemen have been elected Members of the Club, since the Anniversary, May 23, 1855:—

At the Bothal Meeting, June 11, 1855—Revds. Henry Hopwood and Edward Lacey; Messrs Edward Spoor, Charles Gibson, M.D., A. M. Dunn, George Finch, Thomas Stokoe, John Hopper, R. W. Swinburne.

At the Rowland's Gill Meeting, June 29—Mr. Charles Wilson.

At the Chillingham Meeting, July 24—Rev. T. H. Pottenger; Messrs G. T. Smith, J. B. Simpson, W. H. Engledew, W. H. Hills, W. H. Pearson, James Robson, William Oliver, W. A. Temperley.

At the PRESTWICK CAR MEETING, September 12—Mr. Henry Bell.

At the ANNIVERSARY MEETING, held this day, May 15, 1856—Rev. J. C. Lowe, M.A.; Messrs T. M. Douglas, R. Mennell, W. Hunter, J. H. Harle.

DAYS AND PLACES OF MEETING FOR THE PRESENT YEAR.

FRIDAY, *June 6th*,	Riding Mill.
WEDNESDAY, *July 2nd*,	Staward Peel.
MONDAY, *July 21st*,	Teesdale.
TUESDAY, *August 26th*,	Holy Island.
FRIDAY, *September 19th*,	Blyth.

OFFICERS FOR THE YEAR ENDING FEBRUARY, 1857.

PRESIDENT.

John Hogg, Esq., M.A., F.R.S., F.L.S., &c.

VICE-PRESIDENTS.

Sir W. C. Trevelyan, Bart.
W. Kell, F.S.A.
Dennis Embleton, M.D.
Joshua Alder.
Ralph Carr.
Thomas Sopwith, F.R.S., F.G.S.

SECRETARIES.

John Storey, F.B.S.E.
Edward Mather.

TREASURER.

Joseph Blacklock.

COMMITTEE.

Rev. G. C. Abbes, B.A.
Albany Hancock.
T. J. Bold.
John Thompson.
George Wailes.
Daniel Oliver, jun., F.L.S.
Richard Howse, jun.
R. Y. Green.
F. J. Peck.
Thomas Austen.
Joseph Swan.
L. M. Cockcroft.

II.—*On the Effects of the Severe Winter of* 1854-5 *upon Evergreen Vegetation in the North of England.* By Ralph Carr, Esq.

[Read, at the Anniversary Meeting, November 15, 1855.]

The autumn of 1854 had been unusually dry. Not only was there an absence of the rains, which characterise our climate at the end of harvest, but the pastures and turnip fields were not refreshed by the heavy dews so frequent at the same season in ordinary years. The soil in the stubbles and turnip fields was dusty till far on in November. For many weeks the winds had been easterly. We experienced, indeed, the autumn of the north of Germany, from whence these winds blew; and the event proved that the winter of the same region was to extend itself to England.

Up to nearly the middle of January, 1855, there was no severe frost or heavy snow, but at that time snow began to fall, and to accumulate rapidly, but accompanied with very little wind. Indeed, throughout this winter there was a remarkable absence of violent winds and of snow-drift. The frost soon attained great intensity. In situations of moderate elevation (200 or 300 feet above the sea), Fahrenheit's thermometer, against a north wall, frequently stood at from 14 down to 10, at eight o'clock in the morning; that is, at about 20° of that instrument below the freezing point of 32°. In situations near to streams, and in hollows, where hoar-frost was abundant, the temperature was doubtless much lower. The frost went on increasing until about the 14th or 16th of February, when it reached its greatest intensity, Fahrenheit's thermometer being then observed to mark only 1 or 2 degrees, or about 30 degrees below the freezing point. At Chillingham, 6° of cold below Fahrenheit's 0° were indicated (being 38° below his freezing point) on a self-registering instrument, which extended no lower; and at Lilburn, a very superior instrument indicated 9 degrees below Fahrenheit's 0°, showing, therefore, 41° below freezing. Although subsequently to this time the intensity of the cold began to relax, and within a week or two partial thaws were experienced, a large portion of the country continued to be under snow throughout March. April

was cold and stormy, whilst the effects of its bright sun very soon revealed the extent to which evergreens of all kinds had suffered.

The common broom (*Spartium scoparium*) hardly, perhaps, properly merits the designation of evergreen, since its winter verdure is not produced by foliage, but by its vivid and innumerable twigs, which to the eye produce an equally pleasing appearance. This beautiful plant, which is nowhere more abundant than in the border counties of England and Scotland, was very extensively cut down. To the northward of the Lammermuirs, where the country slopes down to the Firth of Forth, and enjoys the softening influence of the sea airs during winter, the destruction had been less, and a considerable mixture of uninjured plants was observable. In Tweedside, and all over Northumberland, except in the most sheltered spots, or where it had been completely buried under snow, the broom was killed to the ground. It is clear, therefore, that with the ordinary north British summer, we could not boast of our beautiful shaws and *knows* of golden broom, were our winters more severe than they are.

The whin, *Ulex europœus,* a tenderer plant than the last, and more decidedly characteristic of an oceanic climate, was very generally killed down all over the north of England and south of Scotland. I observed it to have suffered almost as much even in the milder climate of Argyleshire. But there it had been left unprotected by any fall of snow, whilst a long and intense black frost had prevailed, which during some weeks enabled persons to skate upon the Crinan canal. Both the whin and broom have shot forth vigorously from the root or lower part of the stem.

We now come to the finest native evergreen of the North of England, the holly, in popular estimation regarded as so extremely hardy. But, in truth, it suffers more or less considerably every severe winter, as may be perceived by the weaklier, smaller, and scantier foliage which it always carries in the following year, and which bespeaks impaired vegetative powers. On the other hand, after a succession of mild winters, the hollies assume unwonted luxuriance of leaf and freedom of growth, as if transported to a more benignant clime.

In low, dewy situations, where hoar-frost falls thick, and the nocturnal mists hang longest, hollies, though they grow rapidly, are peculiarly subject to these occasional injuries from frost. In such situations many of the finest old hollies in Northumberland were destroyed in the winter of 1854-5; being killed not only quite to the ground, but in several instances so thoroughly, that even from the root all vitality seemed to have departed, no young shoots appearing even after the lapse of a twelvemonth.

Among the localities where such destruction has been most signally experienced, may be mentioned Chillingham, Lilburn, Bolton, Shawdon, and some of the lower plantations at Hedgley, which descend to the level of the Breamish. Some magnificent old variegated hollies (*golden*), at Shawdon, happily escaped, from standing on a dry bank, probably, but not without betraying signs of the crisis in a very poor foliage and tardy efforts to recover.

The Portugal laurel, *Cerasus lusitanica*, has followed the fate of the holly, showing itself (as might be expected) a little less hardy. At Chillingham, the finest clump of old Portugal laurels that I remember to have seen anywhere, and having in it the largest individual trees, was completely destroyed down to the surface of the ground. Near them some good hollies have shared their fate. At Eslington the loss of fine Portugal laurels was extensive, and some equally large were killed at Bolton and other places situated in valleys. In loftier sites this species, like the holly, escaped unhurt.

The evergreen oak, *Quercus Ilex*, has shown itself a little less capable of enduring a severe Northumbrian winter than the last-named evergreen. Several vigorous young trees were killed at Chillingham, being about ten or fifteen feet high, and standing where dew falls heavily and frost must have been very intense. Others in the same district, but in more open and airy spots, have escaped, though not without perceptible injury. The beautiful ilexes at Howick and Falloden were comparatively safe, as enjoying that coast-climate so favourable to the species.

The common box, *Buxus sempervirens*, though so patient of frost even in severe continental climates, was killed in

numerous instances in Mr. Rogers's nursery-garden at Chatton. A row of vigorous and strong-growing plants of common tree-box, about four feet high, which I had admired, as promising to form a fine hedge, was utterly killed. The plants had not been recently placed there, but were well established; the soil a fine brown loam, and in one place inclined to be black and peaty. In the garden of the Parsonage, also, a fine old box-tree perished. At Hedgeley and other places many shrubs of box bore a very small and poor leaf the following season, showing how severely they had felt the cold. Wherever the box happens to stand on poor exhausted soil, such as we find under trees, it generally dies off after a severe winter. But in this case the frost only hastens natural decay.

The Mediterranean box, *Buxus balearica*, can only be counted among our more tender evergreens, though the Balearic holly, from the same countries, showed itself as hardy as the common. So far as I could perceive none of our Majorca hollies were injured—all, however, stood in dry, airy places, where there was little fog or hoar-frost.

But, among exotic evergreens, I wish to advert only to such as are interesting from their size and frequency, as the Portugal laurel, or for the general admiration they excite, and their promise of becoming familiar features in parks and pleasure grounds.

Rhododendron ponticum is now thoroughly naturalised in many of our woody denes adjoining mansions. It is sowing itself freely on the summit of Brislaw, in Huln Park. Within that noble and varied enclosure nothing can exceed the luxuriance of its growth, in the extensive glades where it has been so freely and tastefully planted. In the winter, when its flower appears only in the promise of its large pregnant buds, what foliage can surpass the vigorous yet gracefully delicate forms of the rhododendron in sheltered and half-shaded situations? It fears neither fog nor hoar-frost, and flourishes most just where the Portugal laurel and holly are least to be trusted, though it will also bear the open hill-side with impunity.

This rhododendron was nowhere hurt by the frost of 1854-5, further than this, that in open, windy situations, it bore a feeble

and diminished foliage the next season. Our northern climate only acts upon it as upon forest trees, in causing it to grow slower than in the southern counties, and generally to stop short of the size which it commonly attains there. Though rabbits and hares do not feed upon this shrub, yet sheep and cattle devour it greedily even during fresh weather, a circumstance which will ever limit its diffusion in open woodlands.

Ivy, both the common and so-called Irish, were not materially injured, though their leaf and growth were checked for a season considerably. Ivy is not nearly so common or so luxuriant in Germany, not even in the mildest Rhenish districts, as in England.

The yew remained unhurt even by fog and hoar-frost; but in exposed, windy situations, its next year's foliage was very poor. Though our frosts cannot kill it, still its growth is stunted by them in our sheltered hollows, and by our cold winds on higher grounds. The yew is never with us the tree it is in southern England and in Ireland.

Rhododendron ponticum is unable to bear the dry, continued frosts of even the warmest parts of Germany; and, probably, if we were to experience two or three successive winters as severe as that of 1854-5, the rhododendron, the holly, the ivy, and the broom, would survive only in a few very warm and well-sheltered spots. The whin would entirely disappear.

The cedar of Lebanon was considerably scorched by the frosty winds, and lost the tips of its last year's shoots, but I did not see it anywhere killed. Save in a few favoured localities, it exhibits only a stunted growth here in the North, though able to live through our coldest winters.

The recently-introduced *Cedrus deodara* is considerably more delicate, although of quicker growth whilst young, and so remarkable for the graceful pendulous growth that distinguishes it. Though a native of the glens of the Himalaya, in North-Western India, up to a severe and snowy climate, it can ill brook our North-of-England winds; and at Chillingham, and many other places, was almost denuded of its leafage in the spring of 1855, being indeed all but killed. To become a fine tree, it appears to me to require the climate of Paris, or at least that of Kent and

Sussex; that is to say, a warm dry summer, with a winter not too long or windy, however severe, for a time.

The *Araucaria imbricata*, now becoming so familiar to our eyes, is wonderfully patient of wind, and endures also the length of our winters exceedingly well. Many specimens of this singular exotic tree perished in this trying winter, but many others survived it, and have sustained no permanent harm. Among these last, I believe, is happily the stately araucaria, at Belsay Castle, where also are many lesser but still remarkable trees of the same species. A fine plant of middle stature, at the Herdsel, the seat of Lord Hume, in Tweedside, was destroyed, or at least lost all its branches. It stands low and near to water, where hoar-frost would be heavy. A similar specimen, on the Terrace at Lilburn Tower, has suffered no less severely, perhaps from standing on a gravelly platform, too open to the frosty sky on every side. A promising specimen at Dunston Hill, perhaps a little taller than these two last, and very robust, remains unhurt. It occupies a favourable site, and stands upon a deep loamy soil. Close to it, however, an old plant of *Laurustinus*, and a vigorous young *Arbutus Unedo* were killed to the ground.

Cryptomeria Japonica has shown itself unexpectedly hardy, for its growth is continued late into the autumn. On an elevated and somewhat exposed site in the grounds of the Rectory at Whickham, are some specimens which show, better than any others I have seen, how robust a form the Cryptomeria will assume in our windy climate. It remained unhurt, or nearly so.

Memoranda like the present may not be without interest in connection with British Climatology, as compared with that of neighbouring countries, with the study of the distribution of plants native and cultivated, and the aspect of our mixed arboreous vegetation, in which evergreen species are not the least frequent and conspicuous.

Many other interesting evergreen trees and shrubs might be noticed, as affected by the recent severe winter, were the present a horticultural paper. The above are sufficent in relation to Climatology, and perhaps some ought to have been omitted.

III.—*Abstract, &c. of a Paper entitled "Observations on the Growth in Diameter of Dicotyledonous (Exogenous) Stems."*

By D. Oliver, Jun.

[Read, November 15th, 1855.]

This paper was the result of an inquiry suggested to John Thornhill and myself by the recent publications of Auguste Trécul, in the "Annales des Sciences Naturelles,"* on the relations subsisting between the newly-formed woody fascicles of a Dicotyledon and the growing points or buds situated above them at the time of their formation, bearing especially upon the views propounded by Gaudichaud† and others. Although some of these papers were the result of investigations more especially directed to the settlement of the theoretical questions involved in these relations, and our experience enables us, I believe, to add, with some degree of final certainty, yet other minor and collateral observations were attached, which also offered to the Vegetable Anatomist no slight interest. I shall endeavour briefly to enumerate the principal points which engaged our attention; our results, I think we may say, were confirmatory of those obtained by Trécul.

Viewed apart from notions as to the more or less individualised character of portions of the plant—for example, of the cell, of leaves, or of the "sprout"—the phenomena involved in the increment of the vegetable structure, in our present instance, of the Dicotyledon, have been, until within recent years, much misunderstood; the true anatomical and physiological characteristics of the cambium as an instance, which so intimately concern an investigation of this kind.‡ This (the cambium) we alluded to at some length, with the suggestion that the term should perhaps now be discarded; not that it is insufficiently expressive and appropriate, rather from its association with the idea of a general, mucilaginous, semi-fluid investment of the alburnum, so long a time indefinitely and incorrectly considered as such, to separate

* Annales des Sciences, 3me Ser., xvii. 250; xviii. 14; xix. 63, 157, 257; xx. 197.

† L'Organographie, &c. des Végétaux, p. 13, &c.

‡ Jussieu, Cours élémentaire de Botanique, p. 52 and 55.

the bark from its subjacent wood-layers, but which is now, as a fluid organically distinct from the surrounding tissues, generally admitted as non-existent.* That the alburnum and inner layer of bark are horizontally continuous at all times, we are, I apprehend, correct in concluding no longer mere hypothesis, but established fact, and, with our present efficient means of observation, of ready demonstration. The copious fluid investment of the alburnum, discovered on removal of the bark in spring, is occasioned, doubtless, by the rupture of the thin-walled and delicate cells of the zone intervening between the alburnum and bark, the true cambium layer *(Couche génératrice, verdickungsring, &c.)*

This imperfect apprehension of the true nature of that zone in which the process of cell-division takes place, appears to have been shared by the eminent French physiologist, Gaudichaud. But the main question at issue between this observer and Trécul—between, indeed, Gaudichaud and some of our most eminent phytotomists, although it involved distinct and differing views of the rôle of the cambium layer, yet hinged rather on the correct solution of a phenomenon of which this generative plane is the seat, and which by theorists has been variously interpreted; perhaps we cannot better express it than in the words of Brongniart, "*Les bourgeons, les vaisseaux, et les feuilles, produisent-ils les fibres et les vaisseaux du bois ou de l'écorce; ou bien, élaborent ils seulement le fluid nourricier ou sève descendante qui dois alimenter ces tissus.*"†

Our first business was to institute experiments more or less in repetition of those of Trécul, devised with a view to afford a satisfactory solution of this question. The chief feature in these experiments was the imposition of certain conditions on the Dicotyledonous stem, whereby the possibility of vertical continuity of the newly-forming tissues with the leaves, &c. above, was absolutely cut off. These conditions were attained by annular decortications and notches. The detail of several of

* One of the most recent publications, in which the case is correctly stated, as I suppose, is the Micrograph. Dictionary (Griffith & Henfrey), p. 107.

† Annales, 3 Ser., vol. xviii, p. 58.

our experiments was furnished in the paper presented at the Evening Meeting : it will suffice to remark that most distinct and vertically isolated formations of cellular tissue were furnished by the exposed cells of the "*Couche génératrice*," laid bare by decortication. With respect to the mode of origin of these cellular masses, I have been able plainly to confirm that they are not mere hernia-like prolongations or emissions from the medullary rays,* but result from the division and multiplication of the exposed cells, whether of the rays or prosenchym, *indifferently*. (Pl. II., fig. 1.) True, desiccation and ultimate death of the cells of the exposed tissue might prevent this process in the outermost of these, yet, in such cases, a "*Couche génératrice*" may establish itself where sufficiently protected from evaporation by overlying cells, provided the cells of this subjacent layer have not their walls too far thickened, nor their vitality too nearly lost.†

With regard to the scraping of the denuded alburnum, adopted by Trécul in some of his earlier experiments, in order to remove, I presume, tissues, to which a doubt might apply as to their independent origin, I may say, it does appear totally unnecessary. Although, in like manner, our first decortications were so treated, yet by this means, so far as I can perceive, no scientific certainty is attained : we remove an outer layer merely to lay bare a subjacent tissue deposited, or rather formed, under precisely similar conditions, and not only so, but to a great extent do we interfere with the successful issue of the experiment. I reported a case (on the Sycamore) in which no means were employed to remove any tissues remaining after the cutting out of a ring of bark, further than wiping, with a cloth, the denuded surface. In this instance, the subsequent formations were much more uniform than in previous cases in which the alburnum was deliberately scraped, although the precaution was fully adopted to intercept the vertical continuity of newly-forming tissues with those both above and below, by sufficiently deep, annular notches.

* See Gaudichaud, Annales, 3 Ser., vol. xviii.

† It would be interesting to investigate how far, and when, in the phanerogamia, the process of *deformation*, of solution of the secondary layers of old cells, and period of actual death of the Nitrogenous Cell contents (Endoplasts of Huxley) can take place.

The formation of thick cellular rings at the edges of the decortications was alluded to: these were especially conspicuous in the Elm. The young parenchym of the bark, exposed on its horizontal section in order to remove a ring, appeared to take part in this formation, and enjoying, in the case of the upper edge of the annulus, an abundant supply of elaborated sap, the multiplication of cells became active, rapid, and irregular.

The conclusions which we considered ourselves legitimately entitled to adduce were embodied in a paragraph of the paper read before the Club, which I subjoin.

"Having ascertained then, as A. Trécul had previously done, that when the surface of a Dicotyledonous Tree is laid bare by decortication, the cells thus exposed, if protected sufficiently from the influence of the weather, can reproduce layers of tissue—that these reproduced plates may be formed without any direct vertical connection with either bark, buds, or leaves above—that these plates are formed of cells developing and multiplying, we have no reason to doubt, according to the usual laws, and that no special series or kind of cells *alone* give rise to these formations, but that all appear indifferently to take part—we may conclude that the evidence rendered by this inquiry disproves the theory of Radicular Fibres as applied to the formation of the ligneous plates of a Dicotyledonous Stem, and that plates of tissue formed on decorticated stems, are not prolongations of the cellular medullary plates merely, but may result immediately from any exposed cells."

Finally, it may appear that undue importance has been attached by Trécul and by us to the Theory of Descending Radicular Fibres of Du Petit Thouars and Gaudichaud.* I am willing to admit that in a limited sense this may be the case; yet I apprehend that these inquiries into the anatomical conditions of wood increment may have assisted in placing in a clearer light the true relations subsisting between the woody layers and the leaves above, leaving no material basis for such supposition, while at the same time the recent statements of the latter author as to the

* Perhaps Schleiden (Principles, p. 257) speaks rather too dogmatically upon this subject. See, on the other hand, Schacht, "*Die Pflanzenzelle*," p. 175.

mode of origin of the isolated tissues horizontally developing upon the exposed alburnum have been shown to be incorrect.

REFERENCE TO PLATE II.

Fig. 1. Transverse Section of "*Couche génératrice*," re-established on the exposed surface of the alburnum of a sycamore, alluded to at page 66. *d.* Wood-cells (prosenchym), and medullary rays of previous year. *c.* This zone of comparatively thin-walled tissue, with vessels, and continued rays, was formed probably in the earlier part of the year in which the experiment was instituted. *a.* This layer may be considered as an outer zone of *c*, beneath which, and sufficiently protected from undue evaporation, &c., a zone (*b*) has assumed the office of "*Couche génératrice*," and it is here, doubtless, that future multiplication of cells in a horizontal direction would obtain ; *a* eventually forming a pseudo-derm. It will be observed that the cells, both of the future woody bundles, and of the medullary rays, equally share in this growth.

Fig. 2. Pear Tree. *a. a. c.* Cellular formations upon the surface of the denuded alburnum ; some of these are isolated, others in vertical continuity with the bark. The stem upon which this decortication was effected was sawn off three inches above the upper edge of the annulus.

Fig. 3. Elm. *b. b.* Exhibit the development of cellular tissue in upward and downward directions : the cellular annulus of the upper edge probably originates from the inner cortical layers, as well as from the "*Couche génératrice.*" *a.* The exposed alburnum.

IV.—*Memoranda of Plants, collected by the Coquet, in* 1855.

By D. Oliver, Jun.

[Read, November 15th, 1855.]

A brief visit, in the course of the past summer, to Alwinton, and the neighbourhood of Rothbury and Harbottle, enabled me to catalogue several species of plants, with the occurrence of which in that district we were previously unacquainted. Nearly every

one visiting the Upper Coquet carries with him his creel and fishing tackle: the little opportunity afforded me by but four or five days of rather indifferent weather convinced me, however, that these might with advantage be laid aside now and then for the vasculum and note-book. I believe there is abundant scope for the Naturalist, on comparatively new ground too, about the head waters and valleys of the Coquet, Alwine, and Reed.

In addition to a list of the commoner species which were met with on this excursion, given to my friend John Storey, the occurrence of which, although almost ubiquitous some of them may be, yet it is always interesting to note from as many points as possible within the limits of our counties, I have thought it worth while specially to record a few which we but seldom meet with in the south of Northumberland, together with a few others which are new to our comital Flora, and to which considerable interest attaches.

Barbarea stricta ? Fries. A plant referable, with doubt, to this species or form, was found near the Coquet, above Rothbury.

Viola lutea, Linn. Hilly pastures, near Alwinton.

Polygala vulgaris, var. *oxyptera,* Reich. A *Polygala* having remarkably broad capsules was found near Shildykes, Alwinton. It probably may be considered as the above variety.

Dianthus deltoides, Linn. Rocks, &c., near the Coquet above Alwinton, and near Flotterton.

Trifolium arvense, L. and

Trifolium striatum, L. Growing together, near the Coquet, between Rothbury and Harbottle.

Rosa hibernica, var.

It afforded me much pleasure to meet with a form of this species near the village of Thropton, some three miles to the west of Rothbury. Having collected this rose in the previous summer, under the guidance of my friend Wilson Robinson, jun., in the Lorton valley, Cumberland, I was enabled to refer it, with some certainty, to the *R. hibernica* type. Submitting specimens to William Borrer, whose intimate acquaintance with the British

Roses is, I believe, unequalled, he kindly pointed out certain respects in which it differed from the form hitherto met with in Ireland and Cumberland. The setigerous peduncle, and the smaller and more numerous prickles, were the chief distinctions noted. It seems very nearly allied to *R. Wilsoni*, a plant, I presume, unknown to grow elsewhere in Britain than by the Menai Straits; it also presents not a little of the character of *Rosa Sabini*, Woods.

True it is that many species of *Rosæ* seem remarkably prone to variation; yet I am not aware that, hitherto, *R. hibernica* has been found to deviate materially from its specific type. I am nearly satisfied that the Rothbury plant deserves to be considered as a marked variety; but, before describing it as such, yet further data must be obtained. Through the kindness of a friend who happened to visit the neighbourhood some time after, and collected the plant, I have obtained examples in more matured fruit.* It is but about two or three years ago that the species was first distinctly ascertained to grow in England, by William Borrer: he discovered the plant in the Vale of Lorton, near Scale-hill, and near the village of Lorton.. It is there found scattered up and down in various hedge-rows. I think it proper to mention here, that almost immediately on my arrival in Rothbury, I accidentally met with George Mennell, of Newcastle, who happened to be staying there at the time. On learning the object of my visit, he informed me that a rose which was new to him, or presented some peculiarity, had caught his attention, somewhere, I believe, about the village. No examples were shown to me, therefore I am unable to say whether this plant be *R. hibernica* or not; it is quite probable, however, that it may be the same, although I did not observe it myself elsewhere than at the station near Thropton; but the limited time spent about Rothbury precluded anything like a thorough search.

The physical configuration of the valley of the Coquet, near Rothbury, and between that place and Harbottle, did, I think,

* Specimens gathered at both periods were placed upon the table, together with examples of *R. hibernica* from near Lorton and the north of Ireland, with allied species and forms from other parts.

recall that of the well known vale of Lorton; and the probability is, that it will eventually be found sparingly scattered through that district.

Sedum villosum, L. Near Alwinton.

Galium pusillum, L. In tolerable abundance at one spot near the Coquet, between Rothbury and Harbottle.

Crepis succisæfolia, Tausch. Thickets near Rothbury and Alwinton.

Hieracium. Among one or two other interesting forms were specimens (or at least one example) which my friend, J. Backhouse, jun., of York, thinks may be, perhaps, the lost *H. oreades* of Fries. I have not heard from him the result of a further examination which he was about to bestow on it. He is at present engaged in the preparation of a Monograph of our British Hawk-weeds; and should our plant prove to be the above, it will form an interesting addition to it.*

Filago minima, Fr. Near Rothbury. It seems strange that Winch, in his "Flora," did not indicate any particular station for this species in Northumberland or Durham, merely stating with respect to it—"in barren, sandy places, not rare." It never occurred to me near Newcastle.

Polemonium cæruleum, L. Declivity above the Coquet, near Shildykes, Alwinton. One of the most interesting plants met with on this excursion. Hitherto observed in a wild state in, I think, but some three counties of England, Derbyshire, Yorkshire, and Westmorland. (Watson's Cybele.) It is frequently enough to be found by cottage gardens, as an undoubted outcast or straggler, but here we may rest satisfied as to its being truly indigenous. I can only guess the altitude of its station above the sea level; perhaps 600 feet may be an approximation.

Melampyrum pratense, L. var. *montanum.* By Simonside. I have already had occasion to allude more than once to the occurrence of forms of *Melampyrum*, evidently con-

* I believe that J. B. now considers this plant to be a form of *H. vulgatum*, although diverse from that usually occurring.

nected closely with this variety, but not according with the too limited diagnoses originally published by Dr. Johnston, I suppose in his "Berwick's Flora."*

Myosotis repens, Don. Near Alwinton.

Juncus diffusus, Hoppe. Near Alwinton. I also met with this plant near Cramlington, a few weeks ago. I trust to have an opportunity before long of more closely watching the development of the ovules and seed of *J. diffusus*, with a view definitely to ascertain whether or not such are perfected, and become capable of germination. It seems always to occur as the halm of *J. communis* (nearly), bearing the panicle of *J. glaucus*.

Carex præcox, Jacq. Near Alwinton. Rather local, or infrequent about Newcastle.

Finally, this list, the result of a hurried visit, may be but a promise of yet more important discoveries in the same quarter.

* See Annals N. H. (N. S.), xii. 219, and Phytologist.

V.—*On the Distribution of Certain Species of Fresh-water Fish; and on the Modes of Fecundating the Ova of the Salmonidæ.*

By John Hogg, Esq., M.A., F.R.S., F.L.S., &c.

(Read, February 21, 1856.)

The distribution of species of fresh-water fish, particularly of the *Salmonidæ*, as well as the methods of fecundating their ova, having for a few years past, at intervals, engaged my attention, I propose to show, in the following pages, by giving some extracts from two unpublished papers, which I read before the Linnæan Society, on these interesting subjects, three or four years ago, what I had then written, and what another author has still more recently made known to other scientific societies with regard to them.

The *first* of these subjects early attracted my notice; indeed, it was in the summer of 1824, when making an extensive tour in Switzerland, that the presence of the beautiful pink trouts, or probably Charr—the *Salmo Umbla*, and perhaps also the *S. Alpinus* (if not identical)—in the small lakes or tarns in the Alps, struck me not only as a fact of remarkable interest, but also as a problem in the economy of Nature very difficult to be solved in a satisfactory manner.

Again, on reading, in 1850, Mr. Weld's amusing little book on "Auvergne, Piedmont, and Savoy," this passage revived the same idea. "The Lac de Guèry (near Mont Dore in Auvergne) is situated in the centre of a plateau, about 4,000 feet above the sea-level. It is startling, at such an elevation, to see so large a piece of water. It occupies the crater of a volcano." . . . . "How trout got into these waters is not so easily explained; suffice it for our present purposes that they are there." (P. 123.)

In my paper, entitled—"On the Artificial Breeding of Salmon, and the Distribution of Certain Species of Fresh-water Fish," which I read to the Linnæan Society, on May 4th, 1852, I observed as follows:—"And indeed, connected with the present subject, is one which I do not think has received sufficient attention from Naturalists—or, at least, as far as I am aware, has it been fully

studied and explained—and this is, the mode of distribution of the species of many of our fresh-water fishes. It is well ascertained that in certain mountain and alpine streams and lakes there are to be seen trout and other fish—the presence of which it is most difficult to account for. Every practical Botanist knows, to his surprise, that in out-of-the-way districts a specimen or two of a rare plant sometimes occurs, which the winds cannot have carried there; but in all probability its origin can only be accounted for in those isolated spots by the seed having been dropped there by birds. So it strikes me that the problem of how trout, and other like fish, were originally introduced into far distant alpine streams and isolated mountain lakes and waters—especially in those pieces of water, or *tarns*, that now fill the craters of extinct volcanos, and which are of comparatively recent date, might be naturally solved in an analogous manner;—that is to say, by water-birds conveying accidentally, or perhaps intentionally, to their young to those places, certain water-animals whereon they feed, taken from some distant river or lake in which that species of fish abounds, and which water-animals may have gorged themselves with the spawn, or impregnated ova, of that particular species, and some of whose ova might be thus conveyed uninjured—at least, uninjured in a vital degree—and falling from these animals, are subsequently hatched in their new locality; afterwards the fry would continue to "increase and multiply." This I merely now mention (since I do not know that it has occurred to any one else) to the Zoologists present, as a possible mode of accounting for the dispersion of certain kinds of fresh-water fish in such extreme and elevated localities, and the solution of which is a problem of much difficulty as well as interest."

After I had finished reading this paper, I remarked that I did not consider it likely that aquatic animals could void, with their *fæces*, the impregnated ova of fishes after being passed through their stomachs and intestines in a sufficiently uninjured state, so as to be *certain* of producing the fry, but that I chiefly alluded to those animals having disgorged the ova from their mouths after having been carried to those distant waters or lakes by different kinds of water-birds. And during the discussion that ensued, it

appeared, from the observations made by some of the Fellows present, that it was possible that some ova might be conveyed by sticking to the feathers, as well as to the downy portions of the legs, of water-fowl. And Mr. John Curtis, the distinguished Entomologist, also mentioned that some of the larger aquatic insects, and water-beetles—especially the *Dyticidæ*—might, without doubt, be the means of conveying the impregnated spawn of fishes from one piece of water to another.

The short abstract of the above portion of the foregoing paper, which appears in the "Proceedings of the Linnæan Society," No. 49, page 179, and which was published two or three months afterwards, is this:—"On the subject of the distribution of the species of fresh-water fishes, Mr. Hogg refers to the presence of *Trout*, and other fishes, in mountain streams and alpine lakes, for which it seems difficult to account; but he suggests, that as the presence of unusual plants in similar circumstances is only to be accounted for by the seeds having been dropped by birds, the problem with regard to fishes might be naturally solved in an analogous manner, their fry having been conveyed to those distant localities by means of water-birds." And the same abstract was published in the "Annals and Magazine of Natural History." (2 Ser., x. 462—December No., 1852.)

Now the other author, to whom I have before alluded, is Dr. John Davy, F.R.S., London and Edinburgh, who, it will appear from the extracts that I here give, has subsequently made some of the like observations. In his recent little work, called "The Angler and his Friend," published in the year 1855, the following dialogue states from it (at page 258) the same thing—"May not the impregnated ova be conveyed by birds (such as the *Water-ouzel*, or *Heron*), adhering to their feet or feathers, or lodged in their bills? The manner in which so many mountain tarns and lakes are found to abound in fish seems to denote as much; and the results of some experiments I have made are favourable to the notion."

And again (at page 261, *ibid.*), "Amicus" says, "You mentioned salmon ova having been taken from the stomach of a trout, and, notwithstanding, proving productive. Just now you

conjectured that the ova might be conveyed by birds, sticking to their feet. Is it not likely that the voracity of birds may aid in the diffusion of fish? Is it not probable that some of the ova swallowed by a *Water-ouzel* or *Heron*, may be disgorged or discharged by the vent, without losing their vitality?"

"Piscator" answers: "The same idea has occurred to me, but an experiment I made was opposed to it. You know how high is the temperature of birds: the stomach of the *Water-ouzel* is probably above 100° of Fahrenheit. Now, this temperature I have found destructive of the life of the embryo."

Also, in a paper entitled—"Some Observations on the Ova of the Salmon, in relation to the Distribution of Species," which I heard read still more recently to the Royal Society—viz., on April 26 last (1855), Dr. Davy repeated part of the preceding, with regard to the transport of the ova in damp weather, by their accidental adhesion to some animal, as a *Heron*, &c., and likewise in frosty weather. And the abstract of that paper, as published in No. 12, vol. vii. of the "Proceedings of the Royal Society," page 363, thus sets forth some of the results of Dr. Davy's experiments:—

"Section 2. That the vitality of the ova was as well preserved in air saturated with moisture, as it would have been had they been in water.

"3. That the ova may be included in ice without loss of vitality, provided the temperature is not so low as to freeze them.

"4. That the ova, and also the fry recently produced, can bear for some time a temperature of about 80° or 82° in water, without materially suffering; but not without loss of life if raised above 84° or 85°.

"5. That the ova and young fry are speedily killed by a solution of common salt, nearly of the specific gravity of sea-water—viz., 1026; and also by a weaker solution of specific gravity 1016.

"Finally, in reference to the inquiry regarding the distribution of the species of fishes, he expresses his belief that some of the results may be of useful application, especially those given in the 2nd and 3rd sections; inferring that, as in moist air, the

vitality of the ova is capable of being long sustained, they may, during rain or fog, be conveyed from one river or lake to another, adhering to some part of an animal, such as a *Heron* or *Otter*, and also during a time of snow or frost; and further, that other of the results may be useful towards determining the fittest age of ova for transport for the purpose of stocking rivers, and likewise as a help to explain the habitats, and some of the habits of the migratory species."

Here, however, I must remark that the statements made in sections 3, and 5, were previously known; for, as respects section 3, Dr. Ransom, of Nottingham, about the middle of January, in the year 1855, communicating to me by means of Dr. Sharpey, the Secretary of the Royal Society, the best method of having some ova of the *Salmon* put up for examination, and which were to be sent to Nottingham, through the kindness of Sir William Jardine, from Scotland, recommended their being packed in ice, as the most certain means of keeping them fresh and of longer preserving their vitality; and I understood they were accordingly so transmitted by railway.

And as to section 5, the young fry of the *Salmon* had before been proved incapable of existing in pure sea-water—an element so favourable to the growth of the parent fishes.

Next, regarding the probability "of the ova swallowed by a *Water-ouzel*, or *Heron*, being disgorged, or discharged by the vent, without losing their vitality." Having had occasion, within the last few weeks, to consult the "Amænitates Academicæ," of Linnæus, I found the following interesting passage in the Essay "Migrationes Avium," which was proposed by C. D. Ekmarck, in 1757 (No. 75, page 599, vol. iv.)—"Quomodo *Anseres*, dum sub hac sua fuga piscium vere vescuntur ovis, eorum multa diglutiunt integra, eademque post diem, vel ultra, in aliis emittunt aquis æque indemnia ac ea devoraverant, Piscium ita sementim facientes, temporibus recentioribus pulcherrimè demonstravit Gmelinus." And this last author, in his preface (page xxv.) to the *Flora Sibirica* (tom. i., 1747), mentioning the Tschumljak river, in the district which is called Aibat, in the Baschcirick tongue, writes, "Hæc passim lacus continet, non magnos quidem,

sed carassiis piscibus (*Cyprinus carassius*, Lin.) abundantes, quum ante tredecim hos annos iter per ipsum illum tractum, ubi jam palus est, ex relatione incolarum commodissime fieri potuerit. Lacus denique recens exortos ferunt initio per aliquot annos piscibus caruisse, quibus nunc abundant. Ut hoc phœnomenon incolæ explicent, non illi latebras excogitant subterraneas, per quas pisces ex lacu in lacum se proripere possint, sed confidenter adfirmant, *Mergos* atque *Anates* ova piscium iis intulisse, ex quibus proles paullatim succreverit."

As it seems that the ova of the Salmon can preserve their vitality at a heat not exceeding 84° of Fahrenheit, a comparison of the temperatures of the stomachs of fish, frogs, water-newts, &c., with those of water-birds, especially of the herons, ducks, mergansers, and grebes, would in some degree show the possibility of the impregnated ova being passed through the intestines, without losing their productive power.*

And in concluding this portion of my subject, I ought to state that I was not acquainted with the two last-cited authorities, at the time when I penned my paper.

Concerning the *second* subject, or "The Modes of Fecundating the Ova of the *Salmonidæ*," to be considered, I will, in the first place, add the following extract from my second paper, "On the Artificial Breeding of *Salmon* and *Trout*, with Remarks on the Modes of Fecundating their Ova," which I read at the meeting of the Linnæan Society on June 7th, 1853:—"I shall have occasion to make a few remarks on the impregnation, or fecundation of the roe of the female *Salmon* and *Trout* by the milt of the males, since they necessarily arise from the observations contained in the latter part of Mr. Fisher's letter, published last month in

* Another communication, entitled—"On the Vitality of the Ova of the *Salmonidæ* of Different Ages," by Dr. J. Davy, which I also heard read at the meeting of the Royal Society on February 7th last, described many experiments, which he had very lately made on the artificially impregnated ova of the *Charr* caught in the river Brathay, near Windermere. "From these," the Doctor asks, "may it not be considered as proved that the powers of resisting an undue increase of temperature, of bearing distant transport, and of retaining life in moist air, are possessed by the ova in a degree increasing with age? And may it not be concluded, that the strength of their vitality, or their power of resisting unfavourable agencies, also increases with age, and fœtal development?" The whole letter is just published in the "Proceedings of the Royal Society," No. 19, pp. 27-33, vol. viii.—(J. H., May 20, 1856.)

the 'York Herald,' and which refer to the views and experiment of Dr. Robertson, in Scotland, as given to the world, in the 'Perth Courier,' in April of the present year.

"I will first read the account of Dr. Robertson's experiment, because the concluding portion of Mr. Isaac Fisher's letter will then be more easily understood.

"'EXPERIMENT IN THE PROPAGATION OF FISH.

"'We understand that Dr. Robertson, of Dunkeld, questioning the popular idea as to the natural history of fish, which is, that the male and female meet on the *redd* or spawning bed, for the purpose of each depositing its roe and milt in the channel—and conceiving, on the contrary, that the ova of the female were impregnated previous to their development within the body of the fish—in order to test this theory, took a number of live female *Trout* from the spawning bed, and having extracted the roe, deposited them in a perforated zinc box, containing also some gravel. All these, upon the 14th of October last, were placed in a running stream; and on examining the box last week, several of the ova were found to be hatched, of which a specimen may be seen by any one taking an interest in the matter. The proof of this will completely do away with the trouble of obtaining the milt to apply to the roe, as is done by the French fishermen, and establishes a theory strongly advocated by Mr. T. Stoddard. From the severity of the winter the whole of the ova are not yet hatched, but a sufficiency are to prove the truth of this theory. We understand that the Doctor is preparing a detailed account of the experiment, which will appear soon.'*

"Mr. Isaac Fisher's letter, dated May 3, and published in the 'York Herald,' May 14, 1853, ends thus:—'I beg, in conclusion, to caution your readers against what I consider an incorrect statement in a Scotch paper of last April, which informs us that a Dr. Robertson, in Scotland, had taken some roe from a female *Salmon* (Trout J. H.) without milting it, and that it had produced the fry. Sir J. Hawkins, in his edition of Walton and Cotton, supports this view, and quotes from the *Phil. Trans.* of 1754,

* From the "Perth Courier," April, 1853.

vol. 48, part ii., p. 87, in proof of the ova being impregnated *before* their deposition; but *Ephemera* (Mr. Fitzgibbon) very shortly overturns this theory, in his beautiful edition of the same work, p. 175, by expressing his surprise at the 'anatomical ignorance' of Sir J. Hawkins, and by denying the existence of external organs of generation in all river fish—a fact which must be patent to every one. I trust, therefore, that no one will be misled by Dr. Robertson, and I recommend all who may try artificial breeding to be guided solely by the clear and clever *Ephemera*.'

"Since the view here alluded to, and said to be supported by Sir J. Hawkins, through a want of anatomical knowledge, is not clearly detailed, I cite the passage itself from Isaak Walton's immortal work, with Mr. Fitzgibbon's *(Ephemera's)* note to the same, as published this year in that gentleman's edition of 'The Complete Angler:'—

"Isaak Walton mentioning (chap. xiii.) 'that *Eels* have all parts fit for generation, like other fish, but so small as not to be easily discovered by reason of their fatness;' Sir John Hawkins adds this note :—'That fishes are furnished with parts fit for generation cannot be doubted, since it is a common practice to castrate them. See the method of doing it in *Phil. Trans.*, vol. 48, part ii. for the year 1754, p. 870.—H.' (Hawkins.) And which note is continued thus by the Editor, or *Ephemera*:—['I am surprised at the anatomical ignorance of Sir J. Hawkins, and at that of the writer in the *Phil. Trans.* No river fish have external organs of generation, and cannot therefore be castrated. Eels have ova and milt like other fresh-water fish, but in minute portions.'—Ed.] P. 175. 'The Complete Angler, by Isaak Walton and Charles Cotton,' edited by '*Ephemera*,' (Fitzgibbon.) Lond., 1853.

"Now, with regard to Dr. Robertson's alleged experiment of hatching the ova of female trout without having scattered, or deposited over them any milt from the male fish—if correctly given in the 'Perth Courier,' as previously read by me—I can only consider it to have been caused by one of the *two* following ways: *First*, where the ova of the female trout had in some way received

the influence of the fecundating principle of the male Trout, *previous* to Dr. Robertson's depositing them in the perforated zinc box; or, *second*, that the 'perforated zinc box,' which contained the ova or roe, as expressed from the females, was *placed* in the 'running stream,' *within the fecundating influence* of the male trout.

"In explanation of my *first* solution, I will cite the following passage from Mr. Ellis's 'Memoir on the Natural History of the Salmon,' wherein he describes the mode of spawning. 'A pair of fish are seen to make a furrow, by working up the gravel with their noses, rather against the stream, as a salmon cannot work with his head down stream; for the water, then going into his gills the wrong way, drowns him. When the furrow is made, the male and female retire to a little distance, one to the one side, and the other to the other side of the furrow; they then throw themselves on their sides, again come together, and rubbing against each other, both shed their spawn into the furrow at the same time. This process is not completed at once; it requires from 8 to 12 days for them to lay all their spawn, and when they have done they betake themselves to the pools to recruit themselves.'

"If *Trout* follow the method here stated by Ellis as that which *Salmon* do sometimes adopt—namely, of 'coming together and rubbing against each other'—it is possible that the female trout from which Dr. Robertson took the ova, might have performed this process with the male, just before she was caught, and by that process those ova, which were then ready for being deposited, might have received the fecundating influence of some of the milt (the *spermatozoa*) from the male. But whilst I mention the mere possibility of this solution, I do not rely upon it.

"Again, as to my *second*, and more likely solution: In Dr. Robertson's experiment, as published in the 'Perth Courier,' it is not stated that the Doctor placed the zinc box, containing the ova and some gravel, in a running stream, where no male trouts were to be found. Consequently, it is exceedingly probable that in the same running stream there were some male trouts, which had deposited their milt near the zinc box, which is expressly

said to have been 'perforated;' thus, then, some of the milt might have readily been carried with the stream through the holes into the zinc box, and so have fecundated the roe, or ova, deposited within it. The fry would then, in the course of nature, be brought to life.

"But I may observe, that '*Ephemera*,' or Mr. Fitzgibbon, seems to differ from the view which I have taken of the possibility of my *first* solution, which is deduced from Mr. Ellis's description of the male and female salmon 'rubbing against each other,' when spawning, as he mentions 'the improbability of impregnation by intromission or *coitus*, either before, or at the time of the deposition of the ova.' (See 'The Book of the Salmon,' by *Ephemera* and Mr. A. Young. P. 186. Lond., 1850.) He does not, however, state the impossibility of this process. It may indeed take place, though perhaps very rarely. Nature, we know, has given to the male semen of all animals a vivifying influence (*spermatozoa*) of great effect; insomuch so, that not unfrequently, a very minute portion* is sufficient to fecundate the ova of the female. Hence, then, to say that the roe of female fish will produce fry, or the young, without having received any influence whatsoever from the milt of the males, is monstrous, and altogether a different subject, which Dr. Robertson, in the account I have just read, does *not* assert."

Next, in order to show how far the above paper, or at least the principal part of it, may have become generally known, it will be necessary to insert here portions of the abstracts of the same, according to their respective dates of appearance.

The *first* of these was briefly given in the "Literary Gazette" of June 18, 1853, which states at p. 603, as follows:—"Mr. Fisher finished his letter with some observations on what he considered an incorrect statement in a newspaper, concerning a Dr. Robertson, in Scotland, having 'taken some roe from a female *Salmon* (Trout J. H.) without milting it, and that it had produced the fry.' Mr. J. Hogg read the account itself, as pub-

* "Mr. Shaw, in his memoir, published in the 'Trans. Royal Society of Edinbro',' writes, 'that the milt of a single male *Parr*, whose entire weight may not exceed one-and-a-half ounce, is capable, when confined in a small stream, of effectually impregnating all the ova of a very large female *Salmon*.'"

lished in the 'Perth Courier,' in April last, and which said that Dr. Robertson, 'conceiving that the ova of the female were impregnated, previous to their development, within the body of the fish,' took some 'live female trout from the spawning-bed, and having extracted the roes, deposited them in a perforated zinc box,' which was placed in a running stream in October last, and he found in April (following) that several of the ova had hatched. The author then considered that this alleged experiment of Dr. Robertson could only be solved by one of the following methods: *First*, that the ova of the female trout had in some way received the influence of the fecundating principle of the male trout *previous* to Dr. Robertson's depositing them in his perforated zinc box; or, *second*, that the perforated zinc box, which contained the ova, as expressed from the females, was placed in the running stream *within* the fecundating influence of the males; and of these two solutions Mr. J. Hogg gave detailed explanations."

The *second*, and longer abstract, or report, appeared two or three months after the former date, in the "Proceedings of the Linnæan Society," No. 52, p. 246. I add this extract from it:—"Mr. Fisher concludes his letter by a caution against what he considers an incorrect statement, taken from the 'Perth Courier,' in which it is said that Dr. Robertson, of Dunkeld, 'conceiving that the ova of the female were impregnated *previous* to their development, *within* the body of the fish,' had taken 'a number of live female *Trout* from the spawning-bed, and having extracted the roes, deposited them in a perforated zinc box, containing also some gravel,' which was 'upon the 14th of October last placed in a running stream; and on examining the box (in April), several of the ova were found to be hatched.' On this latter experiment Mr. Hogg observed, that the result could only be accounted for by one of the *two* following methods. Either the ova of the female trout had in some way received the influence of the fecundating principle of the male trout, *previous* to Dr. Robertson's depositing them in his perforated zinc box; or the perforated zinc box, which contained the ova, as expressed from the females, was placed in the running stream *within* the fecundating influence of the males. The former solution he founds on the mode of

spawning described by Mr. Ellis, in his 'Natural History of the *Salmon*,' from which it would appear that the male and female fishes having jointly made a furrow in the gravel, place themselves one on each side of it, and throwing themselves on their sides, 'again come together, and rubbing against each other, both shed their spawn into the furrow at the same time. This process is not completed at once; it requires from eight to twelve days for them to lay all their spawn.' Mr. Hogg argues from this description, that it is possible that the female trout from which Dr. Robertson took the ova might have gone through this process with the male, and might have thus received the fecundating influence, just *before* she was caught; but on this solution he does not rely. He thinks it more probable, that in the running stream, in which the perforated zinc box was placed, there were some male trouts, which had deposited their milt near the box, and that *some of the milt* might have been *carried with the stream through the holes* of the box, and have so fecundated the ova within it."

And the *third* report—which is exactly the same as the *second* contained in the "Proceedings of the Linnæan Society," was published in the December number, 1853, of the "Annals and Magazine of Natural History," vol. xii. (2nd series), p. 472.

Dr. John Davy, in a paper dated Jan. 4, 1854, which was read to the Royal Society of Edinburgh, on March 6th following, and published in the *Transactions* of that Society (pp. 1-5, vol. 21, part i., for 1854), brings forward some of the same views, and comes to the like conclusions, which I had previously entertained and arrived at, and which are detailed in the extracts from my own paper already annexed. Dr. Davy's paper is entitled—"On the Impregnation of the Ova of the *Salmonidæ*;" and from it I will here quote certain passages relating to our common subject.

"Recently, a precise example has been adduced, how the ova of the *Trout*, taken from the abdomen of the parent fish, and placed in a 'running stream' apart, included in a perforated box, in due time were hatched, producing young fish. The particulars of the experiment, and the result, were published in the

spring of last year, and in more than one of the provincial papers; and Dr. Robertson, of Dunkeld, was named as the institutor and reporter of the trial. Considering the manner in which this statement was made and received, and the practical conclusion deduced—that no longer any trouble need be taken in the artificial mode of breeding to obtain the milt to apply to the roe—I have thought it worth while to give the subject some attention, on the supposition that the result, as stated, may have been accurate; being, as it appeared to me to be, within the limits of possibility; though I cannot say, keeping in mind the structure of the male and female fish, and all the information, hitherto collected respecting the manner in which the generative process is carried on by them, that it is within the limits of probability."

Dr. Davy then refers to p. 17 of Young's "Natural History of the Salmon," for his "negative results" of his experiments on the unimpregnated ova; that is to say, for his never having found one ovum, unimpregnated with milt, productive.

The Doctor having mentioned two trials on some unimpregnated ova of the *Charr*, which gave the same negative results, adds:—"On the 2nd of December (1853) I procured some eggs from two *Charr* taken" on the 25th of November from Windermere, from a breeding shoal* in that lake, "and kept in company with male fish in a well fed by a small stream. The eggs, obtained by pressure to the abdomen, were the few remaining, the greater portion having been previously shed, as was manifest from the lankness of the fish. From this circumstance, they seemed peculiarly favourable for the trial, on the hypothesis of the possible admission of the spermatic fluid *ab externo*. But the result was equally negative with the foregoing. The ova were put into water, the same as that used with the impregnated, fertile ova, and under the same circumstances; all underwent no change, excepting that denoting *loss* of vitality."

* To those who wish to prosecute this inquiry further, I may here observe, that the *Charr* "deposit their spawn on a weedy bed" upon a rocky ground, and not in gravel. And the season of the spawning of another English lake species of the *Salmonidæ*—Schelly, or Gwiniad (*Coregonus Lavaretus*)—is about Michaelmas; and "the place, a weedy shoal;" where, upon water-plants, its ova are to be found. (J. H.)

The author next notices the structure of the male and female organs of the *Salmonidæ* "as seeming to render impregnation from without very improbable."

He continues (p. 4)—"That the fish, in the act of spawning, sometimes come in contact, pressing against each other, and thereby aiding the expulsion of the ova and milt, cannot, I think, be doubted. By many observant fishermen-poachers, addicted to the taking of the fish at the time of their spawning, I have been assured of the fact from their own observations. But this is very different from the act of copulation, as performed in other classes of animals, in which impregnation is effected *before* the expulsion of the ova; but though so dissimilar, perfectly suitable to the end required, and quite in accordance, as we have proof in the artificial process, with the necessary requirements."

Dr. Davy concludes thus:—"Granting the observations referred to—of the hatching of the ova of the *Trout* in the manner described—viz., without milt, so far as was known, being brought into contact with the expressed ova—to be accurate in their detail, it may be asked, Does the result, as stated, warrant the inference, that impregnation was effected *before* the expulsion of the ova? The box, we are informed, containing them was placed in a stream. What is more likely than that they might have been impregnated, so included but not insulated, by the spermatic granules, the spermatozoa of milt shed by some fish in the adjoining water? The diffusibility of these living granules (*animalcules*, J. H.)—not the least remarkable of their qualities—seems to be favourable to this conclusion."

Further, Dr. John Davy, in his little book, "The Angler and his Friend," only published last year, and which I have before cited, again relates the same account of Dr. Robertson's experiment, as reported in the "Perth Courier," and other papers, in the following dialogue:—

Amicus observes (at page 141), "I have recently read in more than one provincial newspaper, that the ova are impregnated not after, as you say, but *before* their exclusion, and consequently that the mixing of the roe and milt in the artificial process, as it has been called, of breeding Salmon, is unnecessary."

Piscator replies (p. 142):—"I have made many experiments on the subject, as have others, and the results have been all *negative*. In no instance that the mature ova have been isolated after exclusion, have they proved fertile, unless milt were added. In the case recorded in the newspapers, in which young *Trout* were said to have been obtained from ova placed in a perforated box in a stream, we cannot be sure that they were isolated; the diffusible mature milt, shed by a male above, might have been conveyed to them in the running water. Moreover, the organisation of the fish exhibits a total inaptitude for the mode of impregnation imagined. If curious on the subject, I may refer you to a paper expressly on it, published in the last volume of the 'Transactions of the Royal Society of Edinburgh;'" and from which some passages have been already quoted.

In conclusion, I ought to explain that the expressions which I have used in this paper—namely, the "vivifying influence of the male *semen* of animals," and the "fecundating principle," or "influence of the milt," or "of the male" fish, indicate the seminal animalcules, or *spermatozoa*—which are doubtless the chief objects or natural instruments in *fecundating* the ova. And it seems now to be settled that these spermatozoa, in some cases forcibly enter through any part of the enveloping membrane into the interior of the ovum, and in others through a peculiar small orifice termed *micropyle*, from its resemblance to the micropyle of the ovule in flowering plants. Barry, Loven Nelson, Leuckart, Johann Müller, and Keber, I believe are among the first who have determined this micropyle; whilst Von Baer, Bruch, and Ransom,* with others, have noticed it in the roe, or ova, of several kinds of fresh-water fishes.

* Whilst this paper was going through the press, Dr. Ransom stated in a letter to me, dated November 24th, 1856, "You will find in the last part of the 'Cyclopædia of Anatomy and Physiology,' article *Ovum*, several of my observations, and a very complete resumé of the whole subject, as also a reference to Von Baer, and other early observers." (J. H., January 29, 1857.)

VI.—*Entomological Notes, for* 1855, *with a Record of Coleopterous Insects new to the Fauna, and additional localities for some of the rarer Species of our Catalogue.* By Thomas Jno. Bold.

[Read, at the Anniversary Meeting of the Club, May 15, 1856.]

The year 1855 was, in this district, a most unproductive one for Insects. This I would, in a great measure, attribute to atmospheric influences: the previous winter was a long and rigorous one, the thermometer often merging upon zero, whilst the spring was most harsh and ungenial; the cold continuing up to the latter end of June, when we had a few hot days, to be followed in July by torrents of rain. The latter end of August and September were fortunately fine, and it was during these months that the principal additions to our Fauna were made.

In Coleopterous Insects, or Beetles, a great scarcity appeared to obtain during the early part of the season; this was the most perceptible amongst the great groups of *Geodephaga* and *Curculionidæ*. During the year some very interesting additions have been made to our Catalogue.

1. *Hydroporus novemlineatus*, Steph. Taken in great plenty, by Dr. Power, in Rothley Lake, in August. I took it also in Prestwick Car, but sparingly, at the Club's Field Meeting there, in September.
2. *Hydroporus melanarius*, Sturm. I have three specimens of this very rare species, from Prestwick Car. I believe that another pair, taken in Scotland, are all that have occurred to the British Fauna.
3. *Hydroporus nigrita*, Fab. Not uncommon, but rather local. I have taken it at Gosforth, Long-Benton, and Boldon Flats. It appears to prefer a well, or a runner therefrom.
4. *Hydroporus melanocephalus*, Gyll.=*elongatulus*, Wollaston. I have several specimens of this distinct species, which as yet has only been found at Prestwick Car.
5. *Hydroporus vittula*, Erich. Taken in some plenty, at Boldon Flats, Gosforth, and other places, within the district; generally in August and September. It is much like *angustatus*, with which it is often confounded, but its larger size will readily distinguish it.

6. *Haliplus variegatus*, Sturm = *Subnubilus*, Babington. A single specimen, taken in the vicinity of Newcastle.
7. *Haliplus fluviatilis*, Aubé. Not uncommon in the Ouseburn, and other streams.
8. *Elmis nitens*, Müller. Taken plentifully in the Wansbeck, by Dr. Power, in August. I also met with it in the Tyne, opposite Close House, in September.
9. *Octhebius rufomarginatus*, Steph. One specimen, from the Wansbeck = Dr. Power. I take it also at Boldon Flats, and at Gosforth, but sparingly.
10. *Hydræna gracillis*, Germ. Not uncommon in streams and pools throughout the district. Although very distinct, it had been confounded with *riparia*.
11. *Cercyon flavipes*, Fab. Found somewhat sparingly at Long-Benton, and elsewhere, frequenting hot-beds, heaps of dung, and of vegetable refuse. At Hulne Park I took it on fungi.
12. *Nitidula flexuosa*, Fab. A distinct and very handsome species, which is also an addition to the British Fauna. I took a series of specimens out of a horse's hoof, which I found on the beech at South Shields, in September.
13. *Corticaria borealis*, Wollaston, Zool., App., ccvi. "Durham Coast."—T. V. Wollaston, Esq.
14. *Paramecósoma serrata*, Gyll.? I found a single specimen of an insect, beneath a chip, in a wood near Washington, which agrees in almost every respect with Sturm's figure of *Cryptophagus serratus*.
15. *Lithocharis melanocephalus*, Fabr. One specimen, taken on the banks of the Devil's Water, near Dilston, in September.
16. *Stenus canaliculatus*, Gyll. Found, but very sparingly, in moss from Gosforth.
17. *Deleaster dichroa*, Grav. Mr. Thornhill took a specimen of this fine species, amongst the gravel, by the Devil's Water, in September.
18. *Anomatus* 12 *striatus*, Müll. My brother found a living specimen of this reputed foreigner, on a decaying pansy, in a garden at Morpeth.

19. *Epierus* 14 *Striatus*, Steph. Several specimens found in rubbish at Jarrow. I found a single one on the sands at South Shields.
20. *Tomicus villosus*, Payk. Mr. Thornhill and I dug sixteen specimens of this insect out of the bark of a felled oak, at Gibside, in August.
21. *Scolytus destructor*, Oliv. Found, in some plenty, at Gibside, in August, and on the banks of the Tyne, near Close House, in September; in both cases in the bark of felled elms. I fancy that this destructive pest must have been overlooked; it was accompanied by numbers of larvæ, and the perfect insect will, in all probability, be detached whenever its pabulum, the elm, is grown.
22. *Dorytomus costirostris*, Schh. Bred from the catkins of willow, gathered at Gosforth.

Additional localities have also been found for some of the rarer species of Coleoptera, recorded in our Catalogue. P. J. Selby, Esq., informs me that *Tarus vaporariorum* (basalis), is occasionally taken on a moor near Twizell, but is very local. *Pterostichus Æthiops* and *Amara oricalcia* have been taken at Rothley; the latter, I have also taken at Heaton, and on the outskirts of Newcastle. *Bembidium lunatum* and *testaceum*, were taken near Ryton, on the banks of the Tyne. *Bembidium Stomoides*, the rarest of our indigenous species, has occurred to myself, on the Tyne, near Ryton, and on the Devil's Water, at, and above Dilston. Mr. Thornhill took a pair on the Wear, near Lumley. Although widely spread, it is however very rare, generally being found singly, or at most in pairs. Its habits are somewhat peculiar, for it lurks under stones, on the very outer borders of the stream, where the gravel and the grass meet. *Bembidium monticulum* was taken on the Devil's Water, rather plentifully, in September. In July, I took a fine series of *Agabus uliginosus (Calymbetes dispar* of Cat.), and of *Hydraporus rufifrons*, at Boldon Flats; both from the furrows of a recently flooded grass field. *Hydroporus Davisii*, has occurred sparingly in the Hartburn; more plentifully in the Derwent, the Ouse, the burn running into the Tyne, at Wylam, and in the Devil's Water. The *var.* of *Hydroporus rivalis*, known as *Sanmarkii*, has occurred in the

Wansbeck. *Hydroporus latus*, a very rare British species, I have taken in the Derwent, and in the Devil's Water; it lives amongst the large stones, in running water. I have again taken *Gyrinus lineatus* in the Ouseburn, and one single specimen in the Derwent.

Parnus auriculatus has been found at Rothley, and on the banks of the Devil's Water. *Elmis valkmari* has occurred plentifully in the Wansbeck, and the Devil's Water. *Elmis variabilis*, *cupreus*, *minutissimus*, and *parallelipipedes*, have been taken in the Wansbeck, and the Tyne. *Lamnebius nitidus*, from Rothley lakes, Gosforth, and Long Benton. *Philhydrus melanocephalus*, in Rothley lakes, sparingly. *Campta lutea* was taken on fungi in Hulne Park. *Conurus litoreus* was taken near Gibside; *Quedius lateralis*, at Wallington: *Stilicus rufipes*, near Scotswood; and *Geodromus plagiatus*, near Rothley. *Cyphon immunis?* under a stone in the Hartburn. *Pachyrhinus leucogaster*, *Coecinella livida*, and *Orchesia miner*, have all occurred at Rothley. *Clytus arcuatus* has been taken near Stockton, by John Hogg, Esq. I caught *Ischnomera melanura*, flying, on the coast at South Shields. Finally, a very rare insect, *Salpingus ater*, was taken by a friend in a most extraordinary locality—viz., perched on a gentleman's shoulder, at Newcastle races.* *Hymenoptera* were perhaps worse represented, in our district, than any other order of insects. *Tenthredinidæ* were almost totally wanting. *Formicidæ* were scarcely to be seen, and the same may be said of the *Fossores*. The *Vespidæ*, or the Wasps, however, were rather common in early spring. I caught numbers of females, the majority of which were of one species, *rufa*. From some unknown cause, they became scarce in summer, and towards autumn scarcely a nest could be found. P. J. Selby, Esq. informs me, in a letter which I had the honour to receive from him, that "among the *Hymenoptera*, the species of the genus *Vaspa* were in greatly diminished numbers, particularly *V. vulgaris*, which is generally very abundant in this locality (Twizell). The queens of this species, I find, seldom make their appearance before the middle of May, whereas those of *V. rufa*, and *V. britannica* leave their winter quarters about the middle of April;

* To Dr. Power, of London, an active and acute Entomologist, I am indebted for the Wansbeck, Rothley, Wallington, and Hartburn localities.

and as the duties of reproduction are over at an earlier period than those of *V. vulgaris*, it accounts for the comparatively trifling damage they do to our ripening fruits." The *Andrenidæ*, or *Bees*, were also very scant; and although I hunted for them with considerable assiduity, yet I have very little of novelty to record. I took *Andrena Collinsonana* at Gibside, in the beginning of September. *Nomada ochrostoma*, in some plenty, near the Ouseburn, at Long-Benton, and near Mitford: it appears to be parasite either on *Andrena albicans*, *A. cineraria* or on *Halicti*, as I found it frequenting a mixed colony of these species. I have also taken *Nomada borealis* at Long-Benton, Gosforth, and Mitford; it is parasitic on *Andrena Clarkella*. Although females of this species are common enough, yet males are difficult to secure. I only took two of the latter, whilst I would have had little trouble to take an hundred females. *Nomada furva*, I have taken but sparingly. Of *Nomada alternata*, an early spring species, I caught a fine male at Gibside, in September, perhaps tempted from his winter quarters by the fineness of the weather. Of *Apathi* and *Bombi*, although some very fine varieties have been taken, yet I am unable to record any novelties.

Not collecting *Lepidoptera*, I am unable to report on the scarcity or abundance of the rarer species: of the White, Tortoise-shell, and other common Butterflies, very few indeed were seen on wing in the district around Newcastle. At Twizell, P. J. Selby, Esq., informs me, that "with the exception of those species of the genus *Pontia*, which, towards autumn, became numerous, the *Diurnal Lepidoptera* were very scarce; indeed, of some species usually very abundant, I did not see or take a single specimen. The nocturnal species, especially the *Noctuidæ*, were in very diminished numbers; at least, so far as I could judge from the few that resorted to the trees, &c., smeared with honey or syrup." I may mention, in conclusion, that I had a specimen of the *Humming-bird hawk moth* brought me, which had been taken in a garden at Slaly, near Minsteracres, rather a high elevation for this tribe of insects.

THOS. JNO. BOLD.

Long-Benton, May 8, 1856.

VII.—*A Catalogue of the Zoophytes of Northumberland and Durham.* By Joshua Alder, Esq.

[Read, at the Anniversary Meeting of the Club, May 15, 1856.]

INTRODUCTORY OBSERVATIONS.

The term "Zoophytes," as employed by different authors, has been made to embrace portions of the Animal Kingdom differing considerably in extent and characters. It may be necessary, therefore, to state that the term is here used in the same sense as by Dr. Johnston in his "History of British Zoophytes." His admirable work has been taken as the standard of reference throughout, and its arrangement and nomenclature have been, as far as possible, adhered to. When science is in a continual state of progress, however, it would be inexcusable entirely to overlook what has been done by recent authors. I have considered it necessary, therefore, to introduce some of the improvements made in the arrangement of the *Polyzoa* by Professor Busk, in his "Catalogue of the Marine Polyzoa of the British Museum." The principal alterations that have been made are in the genera *Lepralia* and *Membranipora*—genera which that gentleman has studied with great care. Dr. Johnston's genera *Cellularia* and *Flustra* have also been so far broken up as to bring together, under the genus *Bugula*, a few evidently allied species, that were divided in "British Zoophytes" between the two former genera; and having thus dismembered the *Flustridæ*, I have further adopted the genus *Carbasea* for the remaining species of *Flustra* with cells on one side only. The *Cellularia* of Johnston, containing eight species, has been distributed by Mr. Busk into seven genera. So great an innovation upon my "text book" I have not ventured in the present instance to adopt; and have, therefore, merely indicated these alterations in the synonymy.

Two or three local Catalogues of Zoophytes, each embracing a portion of the district under review, have already appeared. A pretty full list of the Zoophytes of the South of Durham was given by Mr. Hogg, in his "Natural History of the Vicinity of

Stockton-on-Tees," which appeared in 1827. This list still continues to be our chief authority for the zoophytes of that locality, and contains one or two species that have not been found further north. The principal contribution towards a knowledge of the zoophytes of our coast, however, is "A Descriptive Catalogue of the Zoophytes of North Durham," by Dr. Johnston, published in the Transactions of the Newcastle Natural History Society, in 1832, and accompanied by plates from the etchings of his accomplished lady. This Catalogue contains much original information; yet, though only twenty-four years have elapsed since its publication, it is interesting to observe how great a change this branch of natural history has undergone during the period; much of which has been effected by the distinguished author himself. The classification there adopted has become obsolete, and even the number of species recorded, which Dr. Johnston felt assured at the time would "be found by the Natural History Society of Northumberland to contain such a full list of their zoophytes as will suffice to convey an accurate view of their number and variety," has been more than trebled by subsequent researches. A list of the Hydroid species, collected by Miss Ellen Forster, at Tynemouth, in 1839, will be found in the second edition of "British Zoophytes," and the habitats of others got on the coast are incidentally noticed in the same work.

The curious researches of Sars, Dalyell, and other recent authors, leave no doubt of the intimate connexion subsisting between the Hydroid species of *Anthozoa* and the *Acalepha;* so intimate, indeed, that in many instances, individuals of the one class can only be considered as immature or transition states of the other. The union between the two classes would consequently appear to be inevitable; but, if we except a few isolated cases, too little is yet known of their embryology and metamorphoses to allow of any classification in accordance with such a view of their affinities. For the present, at least, they must necessarily be treated of apart. A difference of opinion still exists among naturalists, in cases where a species alternately assumes the characters of each class, as to which should be considered the perfect or typical form. With respect to the Medusæ

observed by Sars and Dalyell, where the ova were developed into a Hydroid Zoophyte, propagating itself in that condition by gemmation, and afterwards re-assuming the Medusoid form by fissiparous division, there would, perhaps, be little hesitation in pronouncing the Medusa to be the normal form of the species. In some zoophytes, however, the case is different. Observation has shown that the natatory progeny of *Tubularia* are the larval state of that genus, which, after swimming about for a short time in freedom, affix themselves to other bodies, and are developed into zoophytes of the parental type. Mr. W. P. Cocks has seen the same thing in the curious genus *Myriothela;* and though the young of these genera do not assume the perfect medusoid form, as in the allied genus *Coryne*, we can scarcely doubt that both partake of the same general character, and must come into the same category. The extreme delicacy and minuteness of the medusoids of the latter genus, as well as those of the *Campanulariadæ*, have baffled the attempts of naturalists to trace them beyond an early stage, but in most cases they appear to have a very transitory existence. By some they are considered to be the perfect and adult state of the animal, while others take them to be merely partially developed sexual organs, endowed with a locomotive power the more readily to diffuse the ova in distant localities. The close affinity of these genera to the *Tubulariadæ* and *Sertulariadæ* (the embryology of both of which is known), would lead to the belief that the zoophyte will be found to be the typical form in all these families.

In the systems of most modern authors, the *Polyzoa* are removed from the *Zoophyta*, and take their rank in the sub-kingdom *Mollusca*. Their relationship with this group is established through the *Tunicata*, a kind of pseudo-molluscans, with the lower or compound forms of which they have a close affinity. Their dissimilarity to the typical Mollusca, however, is very striking, and I think there are several reasons that might justify us in retaining them among zoophytes, where they still hold a place in nearly all popular works on the subject. In everything that regards external form, they are truly zoophytic. Their branched and plant-like structure; their polypides issuing from

cells and surmounted by a circle of tentacles, and their ovicapsules rising from the compound body, and external to the individual—all follow the zoophytic type. It is not till we examine their internal structure that their affinity to the Mollusca becomes apparent. But admitting their near alliance with the *Tunicata*, it may be asked, Do the *Radiata* form a sub-kingdom really distinct from the *Mollusca?* When the process of development is better understood in the separate groups, it may possibly be found that there are in reality only three grand types of structure in the Animal Kingdom—the *Articulata*, the *Mollusca*, and the *Vertebrata;* the radiated forms being only lower stages of the two former—the *Echinodermata* going to the *Articulata*, with which they have many alliances, and the *Zoophyta* to the *Mollusca*. Such speculations, however, do not belong to my present humble labours. The business of the compiler of a provincial Catalogue is not to form systems, but to discriminate species, and to classify them in a way that may best facilitate their study.

Too little is known of the local distribution of zoophytes in the British seas to enable us to make any complete or satisfacfactory comparison of this with other localities. On the whole, the species of this class appear to be much more generally diffused, and to occupy a wider range, than is the case with most other classes of marine Invertebrata. The following species may be taken as characteristic of our north-eastern shores:—

Eudendrium rameum.
„ confertum.
Tubularia Dumortierii.
Halecium muricatum.
Sertularia tricuspidata.
„ fallax.
„ filicula.
„ fusca.
Thuiaria thuia.
Plumularia Catherina.
„ frutescens.
Grammaria ramosa.
Pennatula phosphorea.

Actinia digitata.
Anthea Tuediæ.
Gemellaria loriculata.
Celepora Skenei.
Bugula fastigiata.
„ Murrayana.
Flustra truncata.
Carbasea papyrea.
Eschara cribraria.
Retepora Beaniana.
Alcyonidium mammillatum.
Farrella pedicellata.
Avenella fusca.

Many of these range throughout the east coast of England and Scotland, but are generally rare or wanting in the south and west. The most abundant of them are *Gemellaria loriculata* and *Flustra truncata*, which are constantly brought in on the fishermen's lines. *Thuiaria thuia* and *Pennatula phosphorea* are also not uncommon.

Comparing our marine Fauna with that of the south coast of England, the most striking deficiency is found in the Asteroid and Helianthoid orders. Our shores do not produce one-fourth part of the recorded British species of *Actinia*, and several of the allied genera are entirely wanting; as are likewise all the calcareous and corticated corals. Of the more conspicuous south-country zoophytes we may note the absence of *Sertularia nigra*, *S. pinnata*, *Plumularia pennatula*, *Campanularia gelatinosa*, *Anthea cereus*, *Adamsia palliata*, *Caryophyllia Smithii*, *Membranipora Lacroixii*, *Flustra chartacea*, *Caberea Boryi*, and *Valkeria pustulata;* and the very rare occurrence of *Plumularia cristata* (only found in one instance), *Auguinaria spatulata*, *Cellularia ciliata*, *Bugula avicularia*, *Lepralia Brongniartii*, *Eschara foliacea*, and *Vesicularia spinosa;* the last, so abundant in many places, is probably rare here on account of the absence of muddy estuaries.

The number of species here given exceeds that of any other local Catalogue yet published. The reason probably is, not that zoophytes are more abundant on this coast than elsewhere, but that more attention has been paid to the minute and less conspicuous forms. The fullest list that I am acquainted with is in Couch's "Cornish Fauna," where the number described amounts to 124.* The Rev. A. Irvine's Catalogue of those found in Dublin Bay (*Nat. Hist. Review*, i. 244) contains 105 species. The other lists that I have seen (printed and manuscript) are below 100. The present Catalogue contains 164 species, of which 17, at least, are believed to be new. They belong to the following orders and families:—

* The Zoophytes recorded in Mr. Thompson's "Natural History of Ireland," vol. iv., amount to 167, but the area embraced in the Report precludes a comparison in the present instance.

ANTHOZOA.

Hydroida—Tubulariadæ		15	
„ Sertulariadæ		30	
„ Campanulariadæ		18	
„ Hydridæ		2	
		—65	
Asteroida		3	
Helianthoida		10	
		— 78	

POLYZOA.

Cyclostomata	11	
Cheilostomata	54	
Clenostomata	14	
Pedicellinea	1	
Hippocrepia	6	
	— 86	
	164	

The principal species may be thus distributed into zones of depth.*

LITTORAL ZONE. Clava multicornis; Coryne Listerii; Tubularia larynx; Sertularia *pumila;* Plumularia echinulata; Laomedea flexuosa; Campanularia Johnstoni, integra; Actinia *mesembryanthemum*, troglodytes, *coriacea;* Lucernaria auricula; Eucratea chelata; Cellepora Hassallii; Lepralia *verrucosa*, unicornis, *punctata*, granifera, hyalina; Membranipora *pilosa*, spinifera; Flustrella *hispida;* Cellularia reptans, scruposa; Alcyonidium *hirsutum;* Bowerbankia imbricata; Valkeria uva; Pedicellina echinata.

LAMINARIAN ZONE. Tubularia indivisa; Sertularia *operculata*, rugosa; Plumularia setacea; Laomedea *geniculata;* Campanularia *Johnstoni*, syringa; Actinia coriacea; Lepralia coccinea, *hyalina;* Membranipora *membranacea*, *pilosa*, Flemingii; Cellularia *reptans*, scruposa; Bugula fastigiata; Flustra *foliacea*, *truncata;* Alcyonidium gelatinosum, *hirsutum.*

* The species which contribute most to give a character to the zone have been denoted by italics.

Coralline Zone. Hydractinia echinata; Eudendrium rameum, confertum; Tubularia indivisa, *gracilis;* Halecium *halecinum*, muricatum; Sertularia polyzonias, *fallax*, abietina, *filicula;* Thuiaria thuia; Antennularia *antennina*, ramosa; Plumularia *falcata*, pinnata, Catherina, frutescens; Laomedea longissima; Campanularia volubilis, *Johnstoni*, syringa, verticillata, *dumosa;* Reticularia *serpens;* Coppinia *arcta;* Pennatula *phosphorea;* Alcyonium digitatum; Actinia *crassicornis*, dianthus; Anthea Tuediæ, Tubulipora patina, serpens; Cellepora *pumicosa;* Crisia eburnea; Gemellaria *loriculata;* Lepralia trispinosa, linearis; Membranipora *Flemingii*, *unicornis;* Cellularia *scruposa*, reptans; Bugula flabellata; Flustra *foliacea*, *truncata;* Carbasea *papyrea;* Salicornaria farciminoides; Alcyonidium parasiticum, mammillatum; Farrella pedicellata; Avenella fusca.

Deep Water. Eudendrium *rameum;* Tubularia indivisa, *Dumortierii;* Halecium halecinum, muricatum; Sertularia *tricuspidata*, *abietina*, filicula, *fusca;* Thuiaria thuia; Plumularia *falcata*, *Catherina;* Campanularia *volubilis*, Johnstoni, verticillata, *dumosa*, gracillima; Grammaria ramosa; Actinia *digitata;* Tubulipora patina, serpens; Diastopora *obelia*, Alecto major; Cellepora pumicosa, *ramulosa*, *Skenei;* Lepralia *reticulata*, trispinosa, *linearis;* Cellularia *ternata*, *Peachii;* Bugula *Murrayana;* Eschara cribraria; Retepora Beaniana; Alcyonidium *parasiticum*.

It remains for me now to express my obligations to those friends who have kindly assisted me, either by information or specimens, in the preparation of this Catalogue. My thanks are especially due to Miss Dale, of Whitburn; Mr. Hogg, of Norton House; Mr. Embleton, of Embleton; Mr. Coppin, of North Shields; and Mr. R. Howse, of South Shields. I am also greatly indebted to Professor Busk for much valuable information, which his extensive knowledge of the subject alone could supply; and to the Rev. T. Hincks for similar assistance. Nor can I omit to mention my obligations to one whose recent loss I, along with all who knew him, have had so much reason to deplore. Had Dr. John-

ston lived, his advice, ever ready, would have been greatly prized on the present occasion. As it is, this small contribution to his favourite science, and in a field where he has already done so much, can only now be offered as a tribute to his memory.

CATALOGUE.

ZOOPHYTA.

Class. ANTHOZOA, *Ehrenberg.*

Order. HYDROIDA, *Johnston.*

Family. TUBULARIADÆ, *Van Beneden.*

1. CLAVA. *Gmelin.*

1. C. multicornis, *Forsk.*

Johns. Brit. Zooph., 30, t. i., f. 1—3.

In rock-pools, on stones, Fuci, and Corallines, between tide-marks; not uncommon.

2. VORTICLAVA, *nov. Gen.*

Polype linear-cylindrical or clavate, soft, naked, affixed at the base, solitary? Head terminal; tentacles in two rows, stout, dissimilar, the upper row capitate.

This genus differs from *Clava* in having the tentacles arranged in two distinct rows or whorls, forming a regular head, and in their being of two kinds. From *Hydractinia* it differs in having two rows of tentacles, as well as in the absence of an encrusting base; and from *Coryne* in not having a corneous sheath. This latter character distinguishes it also from the *Stauridia* of Dujardin, to which it appears to be nearly allied.

1. V. humilis, *n. sp.* Pl. III. fig. 1—3.*

Body white, semi-transparent, nearly of equal thickness throughout: upper tentacles 5, short and stout; lower tentacles 10, about three times the length of the upper. Length of body $\frac{2}{10}$ in.

* An account of the new genera and species of this Catalogue was communicated to the British Association Meeting at Cheltenham, and has appeared partly in the "Annals of Natural History," and partly in the "Microscopical Journal."

On *Corallina officinalis*, in a rock-pool, between tide-marks, Cullercoats.

Only one specimen has yet occurred to me of this interesting little zoophyte, which may readily escape observation on account of its diminutive size. It was observed on a branch of *Corallina officinalis* that had remained for awhile in a glass of sea-water, in the autumn of 1853. The pools where it was obtained have been searched several times since for additional specimens, but without success. I am happy, however, to find that the species was also found in the same year by Mr. Busk, at Felixstowe, in Suffolk. The Cullercoats specimen, which lived with me several days, was sluggish, holding itself always in a curved position, as represented in the figure. The body is nearly cylindrical, tapering slightly towards the upper part, where it enlarges into a distinct head, having two rows of tentacles placed upon it. The mouth is tubular and prominent: the upper tentacles, which surround the mouth, are short and capitate, and generally curved inwards: the lower tentacles form a radiating circle near the base of the head; they are moderately stout, and taper slightly towards the extremity, which scarcely shows any terminal swelling, unless when much contracted. The enlarged head of the upper tentacles is permanent, and when highly magnified is seen to have a congeries of little tubercles, which probably contain thread cells. The embryology is unknown.

Mr. Peach has described, in the "Annals of Natural History" for August, 1856, the change of a zoophyte somewhat similar to this into a naked-eyed Medusa. That gentleman's observations lead him to conclude that this change was a complete metamorphosis, and not a reproduction by gemmation, as is usually the case, though the exact point of transition does not appear to have been observed.

Names given to genera in this family must be considered provisional, and subject to revision if the zoophyte should afterwards prove to be the transition state of something already known. At present this genus has as good a claim to recognition as *Clava*, and some of its nearest allies.

3. HYDRACTINIA, *Van Beneden.*

1. H. ECHINATA, *Fleming.*

Johns. Brit. Zooph., 34, t. i., f. 4—6.

On old univalve shells from deep water; frequent.

4. CORYNE, *Gærtner.*

1. C. LISTERII, *Van Beneden.*

Johns. Brit. Zooph., 41.

On *Corallina officinalis* and other sea-weeds, and on the sides of rock-pools, between tide-marks; not rare. Plentiful at Bamborough.

The researches of modern zoologists show the probability of several species of *Coryne* having been confounded under the name of *pusilla* (or *glandulosa*), but their characters and limits are very badly defined, and require re-investigation. The common species of our coast, which is here referred to the *Syncoryna Listerii* of Van Beneden, has the stem and branches smooth, or very faintly wrinkled, for the greater part of their course; but they are strongly annulated at the origin of each, as well as near the head. The small branchlets are ringed throughout. Where the annulations occur, the stem is generally a little constricted. The heads are moderately small, with four or five imperfect rows of tentacles. The medusoid young, obtained at Bamborough, agrees with that figured by Dujardin for his *Syncoryna decipiens*, and of Sars for *S. Sarsii*, but differs from what Mr. Gosse considers the Medusoid of *C. pusilla.* Dr. Johnston thinks this species is probably the true *C. pusilla*, but Gærtner's figure, as copied by Blainville, resembles rather *C. ramosa*, and I am not sure that Lister's should not be referred to the same. The *Syncoryna pusilla* of Van Beneden is a different and smaller species.

2. C. RAMOSA, *Ehr.*

Johns. Brit. Zooph., 42, t. vi., f. 4—7.

In rock-pools below the Spanish Battery, Tynemouth—*Mr. R. Howse.*

Dr. Johnston considers this to be the *Tubularia muscoides* of Linnæus, an opinion which, I think, is open to doubt. Besides

these two forms of *Coryne*, I have obtained, at different times, another form, apparently a species (Pl. IX., fig. 1, 2) on old crusted shells of *Fusus antiquus*, from deep water, at Cullercoats. Should it prove distinct, I would propose for it the name of *Coryne pelagica*. Very short horny tubes rise at intervals from a creeping stem, and are sharply annulated by ridges of growth; the last formed portion springing from within the other in a cup-like form. The polypes are much elongated, and nearly cylindrical, swelling a little at the end, with the tentacles numerous and very short, set in seven or eight imperfect rows. Height scarcely the tenth of an inch. This is perhaps the *Coryne pusilla*, var. γ of Lieut. Thomas (Johns. Brit. Zooph., 467), of which he says, "γ deep sea; heads pink, subcylindrical—Yorkshire. The polypidom of this species closely resembles the creeping variety of *C. dumosa*." This form also comes near to the *Coryne sessilis* of Gosse (Devon. Coast. 208, t. xiv, f. 1—3), but it differs in the shortness of the arms, and in the character of the horny tube. Mr. Gosse obtained his species within tide-marks.

5. EUDENDRIUM, *Ehrenberg.*

1. E. RAMEUM, *Pallas.*

Johns. Brit. Zooph., 45, t. v., f. 1, 2.

Tubularia ramosa, ibid, in Newc. N. H. Trans. v. 2, 253, t. 10.

Not unfrequently brought in on the fishing lines at Cullercoats and Whitburn; also got from the five-men boats.

According to Sir John Dalyell the reproductive capsules of this species are of two kinds (probably sperm and ovicapsules). Those I have met with form a cluster round the base of the tentacles, and are arranged in a linear or moniliform series, two or three on each pedicle.

2. E. RAMOSUM, *Linn.*

Johns. Brit. Zooph., 46, t. vi., f. 1—3.

In the coralline zone, Cullercoats; rare.

3. E.? CONFERTUM, *n. sp.* Pl. III., fig. 5—8.

Polype white or pale flesh-coloured, with a longish ovate

head, surrounded by a single row of tentacles. *Polypary* tubular, yellowish horn-coloured, strongly wrinkled across but not annulated, slightly branched and expanding a little towards the apertures; base a densely reticulated and closely adhering crust. Height $\frac{1}{4}$ to $\frac{1}{2}$ an inch.

On old shells of *Buccinum undatum* and *Fusus antiquus* from deep water, Cullercoats.

This little zoophyte appears to have been first noticed by Dr. Johnston, though he had subsequently overlooked or forgotten it, as he has not introduced it into his "British Zoophytes;" and when I sent him the description of a specimen got at Cullercoats in 1854, he wrote me that it was something he was unacquainted with. I have since, however, found in his "Catalogue of the Zoophytes of North Durham," published in the Transactions of the Newcastle Natural History Society, mention made of a zoophyte which is undoubtedly the same as this; and the description is so characteristic, that I cannot do better than adopt it.

"I have observed," he says,* "a small Tubularia which invests old specimens of *Murex antiquus* with a dense beard-like coat, and may, possibly, be a species distinct from the above (*T. ramosa*). It is only the quarter of an inch in height, slender, horny, wrinkled, slightly and irregularly branched, the branches without rings at their origins: polypes white, furnished with a single series of obtuse tentacula, which do not seem to exceed ten in number. In this respect it agrees with *T. ramosa*, as characterised by Dr. Fleming, but differs from the specimens which I have seen, and also from Ellis's figure of it, in which the tentacula are much more numerous." The encrusting base, which Dr. Johnston does not appear to have examined, forbids our considering it the young of *Eudendrium ramosum*. The basal ramifications are corneous, and more solid than the ascending stems, rather broad, flat, and undulating in outline, forming a dense network. The spaces between the larger reticulations being nearly filled up with smaller ones, and the whole, in old specimens, apparently united by a membrane. This latter is rather difficult

* "Transactions of the Nat. Hist. Society of Northumberland, Durham, and Newcastle upon-Tyne," ii. 253.

to detect on account of the species being very much mixed up with other parasites, especially *Alcyonidium mammillatum*. The number of tentacles is not very constant, varying with age, and occasionally reaching sixteen, but ten is the more usual number. The mouth is conical when at rest, but varies much in form, sometimes expanding into a flat disc with a wide aperture, similar to what is occasionally seen in *Hydractinia echinata*, to the polype of which this bears a strong resemblance.

Mr. Howse has favoured me with the examination of a zoophyte, parasitical on the operculum of *Fusus Norvegicus*, which is more than twice the size of this and more flexible, having much the appearance of a distinct species; but as I can find no essential difference in the form and mode of branching of the polypary (the only part remaining), it must be considered, for the present at least, to be a large variety of the same.

Another form has lately occurred to me more branched than that described above, and showing at the top of the tube a cup-like expansion, similar to what is represented by M. Van Beneden in his *E. ramosum*. The cup, though continuous with the tube, is more membranous, and soon falls off. The basal part is less ramified. I am unable to say, at present, whether this should be considered a variety or a distinct species. It may possibly be the same with that described by M. Van Beneden under the name of *E. ramosum*, but it is not the *Tubularia ramosa* of Linnæus, of which Ellis's figure must be considered to represent the type.

4. E. CAPILLARE, *n. sp.* Pl. III., fig. 9—12.

Polypary minute, very slender, thread-like, a little branched, transparent, pale horn-coloured, smooth, excepting two or three faint rings near the origin of each branch. *Polypes* terminal on the upper branches, vase or pear-shaped, with a single row of eighteen or twenty long slender tentacles; reproductive capsules on separate short branches near the lower part of the stem, on clustered or verticillate pedicles, two or three capsules in linear series on each pedicle. Height $\frac{1}{2}$ inch.

Parasitical or *Antennularia ramosa*, Embleton Bay.—*R. Embleton, Esq.*

The peculiarity of this elegant and graceful little zoophyte is, that the reproductive capsules are on separate branches from the polypes, the latter always terminating the upper branches, while the former are on branches near the lower part of the stem. The moniliform mode of arrangement of the capsules, on the pedicles, is similar to what is seen in *E. rameum*, where, however, they are in union with the polypes, arranged round the base of the tentacles. A more near approach to the mode of arrangement in *E. capillare* may be found in Cavolini's *Sertolara racemosa** (*Eudendrium racemosum*), which has two kinds of reproductive capsules; one set of which are arranged in moniliform series on umbels, very closely resembling those of our species. According to Krohn (as quoted by Professor Owen), these capsules, in the Mediterranean species, are found to contain spermatozoa; and this may possibly be the case also in the present instance.

For a knowledge of this species I am indebted to Mr. Embleton, who kindly sent it to me, along with some other interesting zoophytes collected in Embleton Bay. It was fortunately preserved in spirits, so that the character of the animal could be distinctly made out; otherwise it might readily be taken for a *Coryne*.

6. TUBULARIA, *Linnæus*.

1. T. INDIVISA, *Linn.*

Johns. Brit. Zooph., 48, t. iii., f. 1, 2.

At and beyond the extreme low-water mark of spring tides, and in deep water; not uncommon.

2. T. DUMORTIERII, *Van Beneden.*

Johns. Brit. Zooph., 50, t. vii., f. 1, 2.

On shells, from the deep-water fishing boats, rather rare.—*Mr. R. Howse*, and *J. A.* Berwick Bay.—*Dr. Johnston.*

3. T. LARYNX, *Ellis* and *Solander.*

Johns. Brit. Zooph., 50, t. iii., f. 3.

* Pol. Mar., t. vi., f. 14.

Tubularia coronata, Abildg. in Mull. Zool. Dan. v. 4, p. 25, t. cxli., f. 1—5.

On stones near low-water mark; frequent.

4. T. GRACILIS, *Harvey*.

Johns. Brit. Zooph., 52, t. iv., f. 3—5, and t. v., f. 3, 4?

On corallines, and other marine substances, generally on a muddy bottom, in the coralline zone and deep water; frequent.

The difference between this species and the last has been very imperfectly defined. The two kinds, as they occur on our coast, appear sufficiently distinct. *T. gracilis* is always found in deepish water; generally forming a mass of interlaced tubes, rising from three to three and a-half inches high. The tubes are very slender, firm (keeping their form when dry), and ringed at intervals, the intermediate spaces being quite smooth. They are irregularly branched; the branches frequently going off at right angles. The heads are large and bright orange-red, bearing the ova on branched footstalks, which, when mature, hang down like a bunch of grapes. The species I refer to *T. larynx* is of humbler growth, seldom reaching an inch and a-half in height, and more frequently, not more than an inch. It lives in rock-pools between tide-marks, forming little tufts, usually attached to stones. The tube is rather less slender than in *T. gracilis*, of thinner consistence (the sides often falling together when dry), and more annulated, the dried polypary appearing wrinkled throughout, with more distinct rings at intervals. It is simple, or very slightly branched. The ovi-pedicles are also less branched in this species than in *T. gracilis*—at least, in any specimens that I have seen; but this character depends very much on the state of maturity of the ova. The colour of them in *T. larynx* is purplish red. This species appears to me to be the true *Tubularia muscoides* of Linnæus, in which opinion I am glad to find that Professor Lovén coincides. There can be no doubt of its being the species described by Pallas, under that name.

5. T. IMPLEXA, *n. sp.* Pl. IX., fig. 3—6.

Tubes small, very slender, generally more or less contorted below, smooth, wrinkled, or regularly annulated beneath a smooth transparent epidermis; slightly and sub-unilaterally branched; the branches going off nearly at right angles to the stem, and a little constricted at their base. Gregarious; forming a densely tangled mass of half to three-quarters of an inch in height.

Discovered by Mr. R. Howse, on an old anchor brought in by the fishermen, from forty fathoms water, thirty miles east of Holy Island.

As the polype of this species has not been observed, its claim to a place in the genus cannot be fixed very decidedly. Its mode of branching is similar to that of the other *Tubulariæ*, but it is much smaller than any species hitherto described. The division of the tube into two coats is curious. This takes place sometimes near the base, but more frequently in the young branches, where the thin, smooth epidermis shows a strongly ringed tube within. The epidermis in dried specimens shrinks to the form of the inner tube, so as not to be distinguished from it.

7. CORYMORPHA, *Sars.*

1. C. NANA, *Alder.* Pl. IX., fig. 7, 8.

Hydractinia, Johns. Brit. Zooph., 463, f. 79 *a*.

Hydractinia? (Alderi) Gray, Catal. Radiata, Brit. Mus. 61.

From the fishing boats, Newbiggin; very rare.

Animal elongated, subclavate, tapering downwards. Head conical, varying to subglobose; the mouth surrounded by a circle of short tentacles; below these the surface is tuberculated; another circle of from fifteen to twenty long tentacles surrounds the base of the head. Body soft and flexible, transparent white, with several longitudinal opaque white lines; when fully extended it is nearly linear, but when at rest the clavate form is very distinct, tapering to a point at the base. Length half-an-inch.

Two specimens of this interesting zoophyte occurred to me

among some sea-refuse brought in by the fishing boats at Newbiggin, in June, 1843. At that time I was paying little attention to this class of animals; but observing it was something I had not seen before, I took a memorandum of it, with two or three sketches, and sent the best specimen off in sea-water to my friend, Dr. Johnston. Unfortunately it did not reach its destination in a fit state for examination; and the notice of it in "British Zoophytes," was taken from the hasty note and sketch that accompanied it. Had I been aware of Dr. Johnston's intention of publishing it, some rather more satisfactory materials might have been supplied. The species has not been again met with on this coast, but the zoophyte found by Dr. John Reid, at St. Andrew's, in 1845, and figured in "British Zoophytes," on the same page with this (p. 463, f. 79 *b*), is either this species, or one very nearly allied. It measured an inch in length. Our animal is evidently a *Corymorpha*, though no sheath was detected; but this seems a very variable character; as in several specimens of *Corymorpha nutans* that I have since met with in dredging, both in the Isle of Man, and in Cornwall, only in one instance did I observe a sheath, and this of so thin and filmy a character as not to be detected without close examination.

The *Hydra tuba* of Dalyell, *Strobila* of Sars, occurs in pools between tide-marks, at Cullercoats. As this is shown by Sir John Dalyell and M. Sars to be the undoubted progeny of a Medusa, I have not given it a regular place in this catalogue, but I cannot altogether omit to notice so interesting a form of apparent Hydroid Zoophyte, as it seems to be pretty permanent in this state. The first time I noticed it was in the autumn of 1854, when it was rather plentiful on stones in shallow rock-pools. Some specimens, preserved in a glass vase, lived several months, multiplying slowly by gemmation. They did not show any disposition to assume the Medusoid form. They were, however, left to procure their own nourishment from such animal matters as might be contained among a few small algæ and zoophytes that were in the same water. They were killed by the severe frosts of the succeeding winter. In the summer and autumn

of the following year, some of these little animals were still found inhabiting the same or neighbouring pools, but circumstances prevented my obtaining any of them for further examination. The number of tentacles varied considerably, according to age. They were capable of great extension and contraction, as was also the body, which varied much in outline at different times. There were four apertures on the disc surrounding the mouth, corresponding to the ovisacs of the Medusæ.

Family. SERTULARIADÆ, *Johnston.*

8. HALECIUM, *Oken.*

1. H. HALECINUM, *Linn.*

Johns. Brit. Zooph., 58, t. viii.

Common in the coralline zone and deep water, and frequently of large size.

2. H. BEANII, *Johns.*

Johns. Brit. Zooph., 59, t. ix., f. 1, 2.

From the fishing boats, Cullercoats; rather rare: also from the five-men boats. "With vesicles on *Thuiaria thuia,* in January, 1848."—*J. Coppin, Esq.*

This species is generally parasitical. Examples have occurred to me upon *H. halecinum,* where all seemed to form one polypary, until the specimens were more carefully examined and each found to bear its characteristic ovicapsules. *H. Beanii* is more slender than *H. halecinum,* and not so regularly and stiffly branched.

3. H. MURICATUM, *Ellis and Solander.*

Johns. Brit. Zooph., 60, t. ix., f. 3, 4.

From the fishing boats at Cullercoats and Whitburn, occasionally, *J. A.* Seaton.—*J. Hogg, Esq.* "Abundant at Cullercoats in the winter months."—*J. Coppin, Esq.* A fine much-branched specimen, measuring, when fresh, 6 inches high, and nearly as much across, was obtained from the deep-water boats, and is now in the Newcastle Museum.

A *Halecium* apparently different from any of the above was

obtained at Cullercoats in 1853. A single compound stem rises in a curve to the height of five or six inches: this is very slightly branched, the branches inclining mostly to one side; the branchlets had been rather thickly set with cells, which appear also to have had a sub-unilateral character. The specimen is old, and neither cells nor vesicles remain, so that any further description of it must be left till a future and more favourable opportunity. The colour is dark brown. Its general contour somewhat resembles that of *Plumularia myriophyllum*.

9. SERTULARIA, *Linnæus*.

* Cells distinctly alternate (*Sertularella*, Gray).

1. S. POLYZONIAS, *Linn.*

Johns. Brit. Zooph., 61, t. x., f. 1—3, and wood-cut 8 *a*, *b*.

On other zoophytes, shells, and sea-weeds, from beyond low water mark to deep water; not uncommon.

Var. β Johns. "Caulescent, pinnate," has occurred only once.

A variety with wrinkled cells is occasionally met with. This may be the same as Dr. Johnston considers to be a variety of *S. rugosa*, "which in habit and in the remoteness of its cells resembles *Sert. polyzonias*." There can be little doubt, however, that it belongs to this species, as I have obtained a specimen with the cells wrinkled on one side of the branch, and plain on the other. The wood-cut in Brit. Zooph. (f. 8 *c*) represents *S. tenella*.

2. S. TRICUSPIDATA, *n. sp.* Pl. IV., fig. 1, 2.

Stem slender, alternately branched, twisted at intervals, and jointed above each cell: cells alternate, rather distant, smooth, exactly cylindrical, a little bent outwards, with a three-toothed rim; ovicapsules strongly ribbed across, with a narrow funnel-shaped aperture. Height 1 to 2 inches.

On other zoophytes from the deep-water or five-men boats, that supply Newcastle market with fish during the spring months; not rare.

Without a careful examination of its characters, this species might be passed over as a smaller variety of *S. polyzonias*, from which it differs in the slenderness of its proportions, in the shape of the cells, and especially in their three-toothed apertures. Mr. Busk has pointed out to me that there is a species very much resembling this found in the South Seas (the *S. Johnstoni* of Gray), of which he has kindly sent me a specimen from New Zealand. Like our species, it is tridentate; but on a careful comparison of the two, I find that the southern form differs from ours in the following particulars. It is of smaller size and more compact mode of growth; the cells are more closely set, smaller, shorter, broader at the base, and attached for a greater part of their length, besides having some peculiar rib-like thickenings of the walls that are not found in the northern species. There are likewise occasionally two or three cells together without a joint. The ovicapsules are very similar, but the aperture is not so much produced, and is conical, not funnel-shaped.

S. tricuspidata is parasitical on other zoophytes, adhering to them by a creeping, much-twisted fibre, from which stems arise at intervals to the height of one or two inches. They are slender, pale horn-coloured, rather shining, dividing dichotomously, or giving off alternate branches, which are frequently again subdivided. The branches are much constricted and more or less spirally twisted at their base; there is also a joint and oblique twist above each cell. The stem, after rising a little, occasionally lays hold of another branch of the supporting coralline, and becomes again creeping for a short distance. The cells are rather distant, cylindrical (not bulging below as in *S. polyzonias*), longer than broad, smooth, attached for about a fourth part of their length, slightly curved outwards and expanded a little at the aperture, which is strongly tridentate, appearing triangular when looked at from above: the margin is thickened by a rib. The ovicapsules are rather more cylindrical than those of *S. polyzonias*, more strongly ribbed across, and have a very narrow funnel-shaped aperture, without teeth.

Esper's Sertular. Tab. xii., called *Sertularia ericoides*, Pall., seems to represent this species.

3. S. RUGOSA, *Linn.*

Johns. Brit. Zooph., 63, t. x., f. 4—6.

Parasitical on other zoophytes from low-water mark to deep water; frequent.

4. S. TENELLA, *n. sp.* Pl. IV., f. 3—6.

Minute, creeping, throwing up short unbranched, or slightly branched stems, which are slender, zig-zagged, and jointed above each cell: cells alternate, rather distant, elongate barrel-shaped, finely wrinkled across; the aperture erect, patent, squared and four-toothed. Length ½ to 1 inch.

Sertularia rugosa, var. Johns. Brit. Zooph., 62, f. 8 *c.*

Parasitical on *Plumularia falcata* and other zoophytes, but not common.

This pretty little species is smaller and more delicate in all its proportions than *S. rugosa*, with which it has hitherto been confounded. The cells are more erect, narrower, and more closely and regularly ribbed or wrinkled across, the wrinkles generally rising a little opposite each angle; there are six or seven in this species—in *S. rugosa* three or four. The aperture is erect, patent, and conspicuonsly squared and four-toothed; in *S. rugosa* the aperture is much less prominent, and always bent outwards. The stem of *S. tenella* is slender, seldom exceeding half an inch in height, and most frequently unbranched; it is waved or zig-zagged, bearing a cell at each angle; opposite each cell there is a joint, above which the stem is much constricted, and slightly ringed or twisted. The cells are more distant than is *S. rugosa*, in this respect resembling *S. polyzonias;* but they are more slender and elongated than in either species. The aperture is closed by a quadripartite operculum, opening in segments, as in *Camp. syringa*, but here the segments are fewer, corresponding with the angles of the mouth. *S. rugosa* has a similar operculum. The ovicapsules, for a knowledge of which I am indebted to the Rev. T. Hincks, scarcely differ from those of *S. polyzonias* and *S. rugosa*, but are perhaps a little more produced at the top. The polypes appear to be yellow or orange coloured. Specimens of *S. tenella* occur in which the creeping fibre throws

out only single cells on short foot-stalks throughout its course. In this form it might be taken for a *Campanularia*.

** Cells opposite or sub-alternate. (*Sertularia*.)

5. S. PUMILA, *Linn.*

Johns. Brit. Zooph., 66, t. xi., f. 3, 4.

On sea-weeds and stones between tide-marks and a little beyond; common.

6. S. ROSACEA, *Linn.*

Johns. Brit. Zooph., 64, and wood-cut, f. 9 (not t. xi., f. 1).

On other zoophytes from deepish water; occasionally. On the sides of rocks at low-water mark, Bamborough.

This delicate little coralline is usually of a pure transparent white; the variety from low-water mark at Bamborough is pale horn-coloured.

7. S. PINASTER, *Ellis* and *Solander*.

Johns. Brit. Zooph., 71, wood-cut 12.

From deep water, Embleton Bay.—*R. Embleton, Esq.*

A few fine specimens of this rare and much controverted species, with ovicapsules, have been got by Mr. Embleton growing round the base of *Plumularia myriophyllum*. They agree very closely with the figure of Ellis and Solander, excepting that the pinnæ are a little longer. It may be a question for future consideration whether the *S. Margareta* of Hassall is not this species with a proliferous growth of the ovicapsules, as it is difficult to point out any other difference between them. Judging from specimens I have seen, this abnormal growth of the capsules would appear to take place occasionally in *S. rosacea*, and also, according to Lieut. Thomas, in *S. tamarisca*. (See Brit. Zooph., 470.) This may explain the reason why *S. Margareta* has been referred alternately to each of these species.

8. S. FALLAX, *Johns.*

Johns. Brit. Zooph., 73, t. xi., f. 2, 5, 6.

On other zoophytes from deepish water; frequent.

This species is pure white when alive, but in drying usually assumes a dark brown colour approaching to black. The tips of the pinnæ first change to a blood-red or reddish brown, which gradually spreads downwards, and the whole soon afterwards becomes brownish black.

S. fallax, like some of its congeners, throws out tendrils, or long curved processes at the ends of the pinnæ for the purpose of clasping the stems of other zoophytes for support. The tendril, laying hold of an adjoining stem, generally turns about once round it, and then, cementing itself firmly to the support, runs a short way along the stem and gives off a fresh branch. In this way specimens are frequently found adhering at many points to *Plumularia falcata*.

A variety of this species is occasionally found much more slender than usual, and with the pinnæ longer and more branched. A fine specimen of this description, obligingly presented to me by Mrs. Naters, has much the aspect of a distinct species. It was obtained from the fishermen at Cullercoats. Plate XI., fig. 1, of "British Zoophytes" appears rather to represent this variety than *S. rosacea*.

9. S. TAMARISCA, *Linn.*

Johns. Brit. Zooph., 74, t. xiii., f. 2—4.

On an old fishing line; Cullercoats, June, 1850.—*J. Coppin, Esq.* Whitburn.—*Miss Dale.* Deep-water boats.—*J. A.*

10. S. ABIETINA, *Linn.*

Johns. Brit. Zooph., 75, t. xiii., f. 1, 1*.

On shells and stones in deep water; common.

11. S. FILICULA, *Ellis* and *Solander.*

Johns. Brit. Zooph., 76, t. xiv., f. 1, 1.*

On shells, &c., from deepish water; frequent.

Tubular fibres sometimes run out from the ends of the pinnæ in this species to a great length, apparently for the purpose of

laying hold of neighbouring corallines or other substances for support.

12. S. OPERCULATA, *Linn.*

Johns. Brit. Zooph., 77, t. xiv., f. 2, 2.*

On *Laminariæ* and other sea-weeds, at and beyond low-water mark; common.

I have got this species alive at low-water mark at Bamborough, but have not succeeded in doing so at Tynemouth and Cullercoats, though it is common there on the stalks of *Laminaria digitata* thrown up by the tide. It appears to live usually beyond low-water mark.

13. S. ARGENTEA, *Ellis* and *Solander.*

Johns. Brit. Zooph., 79, t. xiv., f. 3, 3,* and t. xv.

Beyond low-water mark, mostly in the Laminarian zone; not uncommon. "Exceedingly abundant on the south coast of Durham."—*J. Hogg, Esq.* "Among sea-refuse; not uncommon." Berwick Bay.—*Dr. Johnston.* Less common at Cullercoats, but the young or a small variety is often found growing on the shells of *Fusus antiquus* brought in by the fishing boats. Mr. Coppin finds them to bear ovicapsules in the winter season.

14. S. CUPRESSINA, *Linn.*

Johns. Brit. Zooph., 80, t. xvi.

Cullercoats; rare.—*J. Coppin, Esq.* Tynemouth.—*Miss Forster.* Seaton.—*J Hogg, Esq.*

It is difficult to distinguish this species from the last, as the characters seem to run very much into each other.

*** Cells appressed, sub-four-rowed. (*Nigellastrum*, Oken.)

15. S. FUSCA, *Johns.*

Johns. Brit. Zooph., 70, wood-cuts 6, 11.

From deep water; rare. Dunstanborough.—*R. Embleton, Esq.* Cullercoats, and from the five-men boats.—*J. A.*

The position and character of the cells in this species show an approximation to the following genus.

10. THUIARIA, *Fleming.*

1. T. THUIA, *Linn.*

Johns. Brit. Zooph., 83, t. xvii. and xviii., f. 1, 2.

On shells from deep water; frequent.

2. T. ARTICULATA, *Pallas.*

Johns. Brit. Zooph., 84, t. xviii., f. 3, 4.

From deepish water; rare. Whitburn.—*Miss Dale.* Cullercoats.—*J. Coppin, Esq.* Dredged in deep water, and also cast on shore at Tynemouth.—*Miss Forster.* From the deep-water boats.—*J. A.*

11. ANTENNULARIA, *Lamarck.*

1. A. ANTENNINA, *Linn.*

Johns. Brit. Zooph., 86, t. xix., f. 1, 3.

From the coralline zone and deep water; frequent.

2. A. RAMOSA, *Lamk.*

Johns. Brit. Zooph., 88, t. xx.

On shells and stones in the same situations as the last, but less common. Not unfrequent at Seaton.—*J. Hogg, Esq.*

Much difference of opinion has existed concerning the distinctness of these two species of *Antennularia*, arising from an imperfect examination of their minute characters. As might be expected from their general appearance and habit, the species are undoubtedly distinct, though some confusion has arisen from an erroneous character being fixed upon for dividing them. The absence of the small *tubulæ*, or trumpet-shaped processes between the cells, has been pointed out as distinguishing *A. ramosa* from *A. antennina;* but the fact is that the tubules exist in both species, and exactly in the same number and position, as I have satisfied myself by a careful examination of specimens both from our own coast and from the south of England; those of *A. ramosa* being generally a little smaller and tapering more at the base.

A more reliable character will be found in the number of joints in the branchlets. In *A. antennina* there are always two joints between the cells throughout; in *A. ramosa* only one on the lower and principal part of the branchlet, increasing to two near the top. The internodes in the latter species are also longer and straighter, as may be seen in the magnified figures in "British Zoophytes," t. xix. and xx., where the tubules are likewise represented in each, though the number is deficient. In perfect specimens these are arranged in the following order:—1 below the cell, 2 abreast at the upper angle of the cell, and 1 at a little distance above: this last is on the same internode in *A. ramosa*, and on the intervening or non-celliferous internode in *A. antennina*. Besides these, there are two large tubules (one on each side) at the base of the branchlets, where they join the stem; and in *A. ramosa*, two smaller ones in front and one a little way up the stem. I have not observed these latter in *A. antennina*, though they may possibly be found in luxuriant specimens.

A. ramosa, then, may be distinguished from *A. antennina* by its branched stem, and by the branchlets being long, straight, and tapering, with only a single joint between the cells for the greater part of their length. The branchlets of *A. antennina* are short, stunted, and curved inwards, with two joints between each cell throughout.

12. PLUMULARIA, *Lamarck.*

1. P. FALCATA, *Linn.*

Johns. Brit. Zooph., 90, t. xxi., f. 1, 2.

On shells and stones in the coralline zone, and in deep water; very common.

2. P. CRISTATA, *Lamk.*

Johns. Brit. Zooph., 92, t. xxiii. f. 1—3, and woodcut 16.

A single specimen has been found on *Fucus siliquosus* in Whitburn Bay, by Miss Dale.

3. P. PINNATA, *Linn.*

Johns. Brit. Zooph. 95. t. xxi. f. 4, 5.

On shells, &c., from low-water mark to deep water; not uncommon.

Deep-water specimens of this beautiful and delicate species sometimes reach the height of five or six inches on our coast.

4. P. SETACEA, *Ellis.*

Johns. Brit. Zooph., 97, t. xxii., f. 3—5.

On *Laminaria digitata* and other sea-weeds at low-water mark and in shallow water; frequent.

P. setacea seldom, if ever, exceeds an inch and a-half in height in this locality.

5. P. ECHINULATA, *Lamk.*

Johns. Brit. Zooph., 464, wood-cut 80.

On stones between tide-marks, and on the roots of *Laminaria digitata;* not rare. Cullercoats and Ryhope.

This species appears to be more widely diffused than was at first expected, but has been passed over as a small variety of one or other of the two preceding. The three species are so nearly allied that some little care is required in discriminating them. The number of joints in the stem and pinnæ, and the curious trumpet-shaped processes or tubules, afford the most reliable characters. *P. echinulata* is rather robust, compared with the other two, and is always of humble growth, scarcely rising above an inch from a strong, creeping root-fibre, on which the ovicapsules are profusely developed. It differs from *P. pinnata* in having a joint of the stem above each pinna, in which it agrees with *P. setacea*, but it differs from *P. setacea*, and agrees with *P. pinnata*, in having generally only one joint of the pinna between the cells; *P. setacea* has always two. There is now and then an additional joint developed in parts of *P. echinulata*. *P. pinnata* has one short, small tubule below each cell; *P. echinulata* has the same, but has an additional one behind and above the cell. *P. setacea* has two longish tubules below each cell (one on each joint), and two abreast behind and above the cell: there is also a tubule on each joint of the stem, on the opposite side to the pinna, which is not the case in either of the other species. When

the trumpet-shaped processes are present, they afford excellent characters, but they are frequently rubbed off in worn specimens. The capsules of *P. echinulata*, besides being developed from the creeping fibre, differ from those of *P. pinnata* in being smaller, more rounded, and more strongly echinated, but the latter character is very variable in *P. echinulata*, which appears to have led to some mistakes. Fig. 81, p. 465, of Johnston's "History of British Zoophytes," and Pl. IX., f. 26* of Landsborough's "Popular History," both called *P. setacea*, appear to have been taken from specimens of *P. echinulata*, as the pinnæ and ovicapsules show the characters of this species, and not of *P. setacea*, which has long flask-shaped capsules, developed in the axillæ of the pinnæ. Pl. XXII., f. 5, of Brit. Zooph. correctly represents the latter species, though the tubules are not well defined.

6. P. CATHERINA, *Johns.*

Johns. Brit. Zooph., 97, wood-cuts 1, 17.

On other zoophytes and Ascidia from deep water; frequent.

The tubules in this species are developed on the radical fibres as well as on the stem and pinnæ; those on each side of the cell are mounted on pedicles and beautifully displayed. The number in connexion with each cell is seven: three below, two at the sides, and two behind; the latter are sometimes absent.

7. P. MYRIOPHYLLUM, *Linn.*

Johns. Brit. Zooph., 99, t. xxiii., f. 4, 5.

A fine specimen of this species was procured in Embleton Bay by R. Embleton, Esq.

8. P. FRUTESCENS, *Ellis* and *Solander.*

Johns. Brit. Zooph., 100, t. xxiv., f. 2, 3.

From deep water; rare. Whitburn—*Miss Dale.* Hartlepool—*J. Hogg, Esq.* Cullercoats—*J. Coppin, Esq.*, and *J. A.* "From muddy bottom in forty-five fathoms off the Tees, in April, 1845, and again in March, 1846, both times with ovaries."—*Lieut. Thomas.*

Family. CAMPANULARIADÆ, *Johnston.*

13. LAOMEDEA. *Lamouroux.*

*Cells cup-shaped.

1. L. DICHOTOMA, *Linn.*

Laomedea dichotoma, var. α, Johns. Brit. Zooph., 102, t. xxvi., f. 1, 2.

Campanularia gelatinosa, Van. Ben. Campan., 33, t. i., ii.

In pools between tide-marks, Bamborough; rather rare. South coast of Durham—*J. Hogg, Esq.*

It has become necessary to divide the *L. dichotoma* of Johnston into two species, distinguished by the character of their cells. Those of his var. α, which I take to be the true *dichotoma* of Linnæus, and the "Sea-thread coralline" of Ellis, Pl. xii., *a*, A, and Pl. xxxviii., fig. 3, has the cells rather wide, with a plain margin: this kind is found between tide marks, and appears to be the species represented by Dr. Johnston in his Pl. xxvi., fig. 2. It is common in some parts of the south of England, and is particularly abundant at Tenby; but, as far as my experience goes, it is rare in the north. I have only met with it once on our coast, and of small size. Dr. Johnston's remark, that it is common within tide-mark, would, however, appear to imply that he found it so in Berwick Bay. What he got on branches of trees, that had been washed into the sea, probably belonged to the next species. The fishermen of our coast frequently bring in branches of trees, fished up in deep water, covered with barnacles and zoophytes, among which *L. longissima* is not uncommon.

2. L. LONGISSIMA, *Pallas.*

Sertularia longissima, Pallas, Elench. Zooph., 116, No. 67.

Laomedea dichotoma, var. β, Johns. Brit. Zooph., 102.

In deep water; frequent.

The species of *Laomedea*, in many of their characters, come so near to each other that it is difficult to distinguish them. This

is especially the case between this species and the last. Their mode of branching and annulation are so similar that, without seeing the cells, they might readily be pronounced to be varieties of the same. The cells of this species, however, are much deeper and narrower than the other, and are very strongly denticulated round the margin (Pl. V., fig. 4). Unfortunately, on account of their deciduous character, and the deep-water habitat of the species, it is rare to meet with a specimen that retains any vestige of them, even when got fresh from the fishing lines, on which they are frequently brought on shore. *L. longissima* (as thus distinguished) grows to a much larger size than *L. dichotoma*, and has a stronger and darker stem, which is rather more flexuose, and the branches more regularly alternate. The stem becomes black in old individuals. From this circumstance, together with its large size, there can be little doubt that this is the species described by Pallas, though he does not give the character of its cells.

Lieut. Thomas says that he finds the cells of *L. dichotoma* (*longissima?*) always crenulated; but he adds that the crenulations are shallow, and like those represented in Van Beneden's figure of *C. volubilis*,* which does not exactly correspond with my observations.

3. L. GENICULATA, *Linn.*

Johns. Brit. Zooph., 103, t. xxv., f. 1, 2.

On the fronds of sea-weeds, especially *Laminaria digitata*; very common.

4. L. FLEXUOSA, *Hincks, MS.*

Laomedea gelatinosa, var. *a*, Johns. Brit. Zooph., 104, t. xxv., f. 3, 4.

Campanularia geniculata, Van. Ben. Campan., 34, t. iii., f. 1—6.

On rocks and stones between tide-marks, and occasionally on sea-weeds; frequent.

Dr. Johnston was certainly wrong in uniting this species with

* Brit. Zooph., 466.

the *L. gelatinosa*, so admirably described by Pallas. The compound stem, sub-verticillated mode of branching, and crenulated cells of that species, at once distinguish it from the others. *L. flexuosa* is much more nearly allied to *L. geniculata*, with which it has sometimes been confounded. Their distinctive characters have been well pointed out by Dr. Johnston, and consist principally in the annulations of the stem, and the length of the pedicles. In both, the cells have a plain margin. The ovicapsule of *L. flexuosa* is much more elongated than in *L. geniculata*, and not so much constricted at the top.

5. L. NEGLECTA, *n. sp.* Pl. V., fig. 1, 2.

Polypary minute: stem filiform, sub-flexuose, with two or three alternate simple branches, each bearing a cell; the stem is annulated with from four to seven rings above the origin of each branch, and sometimes slightly ringed below; the branches are ringed throughout; cells narrow and deep, with alternate deep and shallow crenations, forming about eight bi-mucronated denticles round the margin. *Polype* with fifteen or sixteen slender tentacles. Height $\frac{2}{10}$ths in.

On the under side of stones in pools between tide-marks. Cullercoats and Tynemouth; frequent.

This delicate little *Laomedea*, though apparently not rare, has hitherto escaped observation; or, if observed, has been passed over as the young of the last, with which it is sometimes found associated on the same stone. It is, however, not very readily seen, unless the stone is examined with a magnifier. It differs from *L. flexuosa* in being of much humbler growth, more slender, and in having smaller, narrower, and deeper cells, crenulated on the margin. The crenulations are very difficult to detect on account of the extreme tenuity of the edges. In their sub-turreted character, they resemble those of *L. gelatinosa*, though the shape of the cell is different, as may be seen by reference to Pl. V., fig. 3, where a cell of *L. gelatinosa* is figured for comparison. That species has not yet been observed on this coast.

**Cells pod-shaped.

6. L. LACERATA, *Johns.*

Campanularia lacerata, Johns. Brit. Zooph., 111, t. xxviii., f. 3.

Laomedea lacerata, Hincks, in Ann. Nat. Hist., 2nd ser., v. 10, p. 86.

Parasitical on *Plumularia falcata* in Berwick Bay.—*Dr. Johnston.*

7. L. ACUMINATA, *n. sp.* Pl. V., fig. 5—8.

Polypary minute, scarcely branched; with a slender, annulated stem; the annulations strongest at the base and becoming fainter or disappearing towards the cell: cells thin, membranous, finely striated longitudinally, elongate pod-shaped, squared below, and tapering to a fine point above; the margin slightly crenulated. *Polype* reaching, when extended, to two or three times the length of the cell, with about twenty muricated tentacles, united by a web at the base. Height $\frac{1}{10}$th inch.

On an old shell of *Fusus antiquus* from deep water, Cullercoats.

This is an extremely curious and interesting species, which one would scarcely think of referring to the genus *Laomedea*, were it not for its near alliance to the *L. lacerata*. The stem rises from a creeping fibre, and, in most of the specimens observed, bore only a single polype, but in two or three instances, a branch bearing a second polype was seen proceeding from it. The cells are extremely elastic and membranous, changing form with the polype, and scarcely to be distinguished from it when alive, excepting at the apex, when the animal is withdrawn. The polype, when extended, stretches far beyond the cell, the latter adhering closely to it and becoming cylindrical. The whole animal is very extensile, and frequently changes form. The tentacles sometimes appear short and stout, and at other times, they are extended into long and slender threads, as in the fresh-water *Hydra*, to which the animal then bears considerable resemblance. The tentacles are united by a web for about one-

sixth of their length, a circumstance I have not observed in any other species. The margin of the cell appears to be crenulated. This character, however, is difficult to ascertain. I have watched the opening of the cell several times when the polype was emerging from it, without being able to detect the exact form of the margin, which is extremely thin and membranous.

14. CAMPANULARIA, *Lamarck.*

1. C. VOLUBILIS, *Linn.* Pl. IV., fig. 7.

Stem creeping, sometimes giving off shoots in a free state, generally spirally twisted: pedicles rather longish, spirally twisted and not ringed at the base: a single spherical ring below each cell; cells generally rather narrow and deep, with about ten shallow, blunt denticles round the margin: ovicapsules rising on short pedicles from the creeping stem, oblong flask-shaped, smooth, with a long narrow neck. Height $\frac{1}{10}$th inch.

Sertularia volubilis, Linn. Syst. Nat., 12th Ed. 1311.
Small climbing coralline with bell-shaped cups, Ellis. Corall. 24, t. xiv., f. *a*, A.

On *Plumularia falcata*, *Sertularia fallax*, and other zoophytes from deep water; frequent.

Three or four species have hitherto been confounded under the name of *Campanularia volubilis*. It is, therefore, necessary to redescribe and discriminate them, and to ascertain, if possible, to which the Linnæan appellation properly belongs. Unfortunately the description of that author is very imperfect; but as he quotes the excellent figures of Ellis, with which his description, as far as it goes, corresponds, these may fairly be taken as representing the true *C. volubilis*. The distinguishing character of the species there represented is the spirally twisted stem; and Ellis remarks in his description, "that at the bottom of each (cup), where they join the stalk, the microscope discovers to us a very minute spherule, or little ball, as in some drinking glasses." With these characters the species here described perfectly agrees. I have for some time been satisfied that this was distinct from the *C. volubilis* of Johnston and other modern British authors, but it was

not until lately that I was so fortunate as to meet with its ovicapsules, the peculiar form of which will, I think, remove all doubt on the subject. This species is almost equally common on our coast with that described by Dr. Johnston (which I propose calling *C. Johnstoni*), but on account of its usually inhabiting deeper water, it is not so generally met with. They may, however, be occasionally found mixed together on the same zoophyte, particularly on the stem of *Plumularia falcata;* but when their peculiar characters are known, they can readily be distinguished from each other. *C. volubilis*, as here distinguished, is scarcely more than half the size of *C. Johnstoni*, and has the cells usually narrower and more cylindrical, with the crenations of the margin blunter and shallower. But the best distinguishing character is in the pedicle, which in this species is always spirally twisted throughout, though becoming less marked towards the top, where, in most cases, a single spherule only supports the cup. The creeping stem is generally, but not always, twisted when attached; but when, as is often the case, it becomes free, its spirally twisted character is beautifully displayed, and it has the appearance of a minute transparent cord, with a club-shaped termination. The pedicles and cells arising from the free part of the stem, are always shorter than where it is attached, and more nearly resemble Ellis's figure. The ovicapsules are oblong flask-shaped, smooth, compressed laterally, and produced into a very long and narrow neck: they rise from the creeping stem by short pedicles of two whorls.

2. C. Johnstoni, *n. sp.* Pl. IV., fig. 8.

Stem creeping, plain; pedicles long, with numerous close-set rings at the base, and more or less ringed at the top; the middle part usually plain, but sometimes ringed; cells deep and rather large, with ten or twelve strong denticles round the rim: ovicapsules nearly sessile on the creeping stem, ovate-oblong, strongly plicated transversely, and truncated at the top. Length one and a-half to two-tenths.

Campanularia volubilis, Johns. Brit. Zooph., 107, wood-cut

18. Couch, Cornish Fauna, pt. 3, 40, t. xi., f. 1. Gosse, Ramb. Dev. Coast, 296, t. xviii.

On sea-weeds, zoophytes, shells, &c., from between tide-marks to deep water; common.

This species is of more robust growth than the last, with the cells larger and more strongly denticulated; they are also wider, but this character is rather variable in both species. The pedicles are longer and stouter, and have always numerous close-set rings at the base, and also several rings at the top; the middle part is variable, sometimes partially or even wholly ringed, but more frequently plain. There is sometimes a joint in the pedicle, in which case it is ringed* above. The creeping fibre is always plain, and seldom, if ever, detached. The ovi-capsules are large, ovate or sub-cylindrical, more or less elongated, with a truncated top, and very strongly plicated transversely. They rise from the creeping stem by scarcely perceptible pedicles. Mr. Gosse has represented a spur at the bottom, which I have not observed.

It may be a question for future solution whether this species is ever branched. I have found branched specimens from deep water very much resembling this, with a ringed base to the stem and a strongly denticulated cup, which I believe to be the young of *Laomedea longissima*, having found specimens a little more advanced with the capsules of that species. In Ellis and Solander's "Zoophytes," however, a figure is given of a branched specimen under the name of *Sertularia volubilis*, with capsules resembling those of *C. Johnstoni*.

3. C. Hincksii, *n. sp.* Pl. IV., fig. 9.

Stem creeping, plain: pedicles long, nearly smooth, with two or three slight spiral twists at the base, and two or three spherical rings at the top, one of which is within the cup: cells rather long, with parallel sides, wrinkled or lineated longitudinally; marginal denticles 10, of a

* It is important in this genus to distinguish between rings, with lines returning into themselves, and spiral ridges, as the distinguishing characters of the species often depend upon them.

squared or castellated form, a little indented at the top. Height $1\frac{1}{2}$ to 2-10ths.

Campanularia volubilis, var. Hincks in Ann. Nat. Hist., 2nd Ser., v. 11, p. 180.

On shells and zoophytes from deep water; rather rare.

This species differs from the two former in the castellated form of the rim, and also in the shape of the cell, which is broader at the base and lineated longitudinally; the spherical ring within the cup is also a distinguishing character. The pedicle is long, and with the exception of one or two rings at its junction with the cell, and a slight spiral twisting at the base, it is smooth. In this respect it differs from the *C. volubilis* of Van Beneden, the cell of which, though differing in shape, has a somewhat similar castellated rim, but the pedicle is short and strongly annulated throughout. This latter will probably constitute a fourth species. The *C. Hincksii* was first noticed by Mr. Hincks, who described it in the Annals of Natural History for March, 1853, as a curious variety of *C. volubilis*, from specimens sent him by Mr. Templar from the west of England. I have since met with it sparingly from deep water on our coast. Mr. Hincks informs me that in his specimens the ovicapsules were apparently smooth, but from their imperfect state of preservation, this character was not satisfactorily made out. My specimens are without ovicapsules.

4. C. INTEGRA, *J. Macg.*

Johns. Brit. Zooph., 109, t. xxviii., f. 2.

On the roots of *Laminariæ* and on *Ascidiæ* at low-water mark, Bamborough.

5. C. SYRINGA, *Linn.*

Johns. Brit. Zooph., 110, wood-cut 19.

Parasitical on other corallines and on small *Fuci;* not uncommon.

6. C. VERTICILLATA, *Linn.*

Johns. Brit. Zooph. 112, t. xxvi., f. 3, 4.

In deepish water at Cullercoats; not rare.—*J. A.* Near Hartlepool.—*J. Hogg, Esq.*

7. C. DUMOSA, *Flem.*

Johns. Brit. Zooph., 113, t. xxvii., f. 2—5.

On other zoophytes, shells, and stones in deep water; common.

This species, in its free and erect state, has a robust mode of growth. Besides the two varieties mentioned by Dr. Johnston, there is another with rather smaller cells and a simple stem, which is attached only at intervals to other zoophytes, hanging from them in a festooned fashion.

8. C. GRACILLIMA, *n. sp.* Pl. VI., fig. 5, 6.

Stem erect, compound, sub-unilaterally branched: cells very slender, long, tubular, thin, set on loosely twisted pedicles of about two whorls: aperture entire. Height 1 in.

On shells and zoophytes from deep water; occasionally.

This is a critical species, greatly resembling *C. dumosa*, from which it can only be distinguished by comparative characters, though its general appearance and habit at once strike the eye as something distinct. It is much smaller than *C. dumosa*, thinner in texture, and more flexible when fresh, with narrower cells set on longer pedicles. The stem is erect, and generally compounded of two or three tubes, diminishing to one at the ends of the branches. It is a good deal branched; the branches often rising more from one side of the stem than the other. The cells are long, very slender, thin and transparent, with a smooth rim: they are set on pedicles about one-fourth the length of the cells, loosely twisted, and making about two turns. They generally rise at a less angle from the stem than in *C. dumosa*, and are more fragile, being very apt to fall off when dry. The cells of *C. dumosa*, on the contrary, are more persistent than in any other species of the genus. *C. gracillima* appears usually to assume the erect form; only in one instance have I observed it creeping over the surface of a shell near the base of the ascending stems.

A *Campanularia* from Bass's Straits, of which Mr. Busk has

kindly sent me a drawing, is very similar to this, if not identical.

15. RETICULARIA, *Wyville Thomson.*

1. R. SERPENS, *Hassall.*

Campanularia serpens, Hass. in Zoologist, No. 69, p. 2223. Trans. Micros. Soc., v. 3, p. 163, t. xxi., f. 4.

Reticularia immersa, Thoms. in Ann. Nat. Hist., 2nd Ser., v. 11, t. xvi., f. 2, 3.

Parasitical on the stems of *Sertularia abietina*, *Plumularia falcata*, and other zoophytes from deep water; common.

This zoophyte is very abundant on our coast. Scarcely a specimen of *Sertularia abietina* can be obtained from deep water that is not more or less invested with it. In its old state it completely covers the *Sertularia*, and the cells are so crowded that their character is not easily recognised. They are, however, perfectly distinct from the creeping stem, oblong, and attached for about one-third of their length, rising up erect towards the aperture, which is slightly expanded.

16. GRAMMARIA *Stimpson.*

"Polypidom rectilinear, elongated, cylindrical, composed of aggregated tubes, generally without branches, which, when they occur, are of the same character as that from which they spring. Cells arranged on all sides, in more or less regular and equidistant longitudinal rows, giving a section of the stem a star-like appearance."—*Stimpson.*

1. G. RAMOSA, *n. sp.* Pl. VI., fig. 1—4.

Polypary stout, horn-coloured, irregularly branched; the branches rising from a constricted base: cells cylindrical, bending outwards to a distance nearly equalling the width of the stem, with an even margin, behind which they are frequently annulated with one or two lines of growth; they are set in about four longitudinal rows, the adjoining cells alternating, and the opposite cells

nearly on a line with each other. Height one to two inches.

From the deep-water fishing boats; rather rare.

This species comes very near to the *Grammaria robusta* of Stimpson,* of which it may possibly be a variety, the principal difference being that the British form is always much branched, while the American species is linear and straight. The genus is new to Europe, and does not appear to differ much from the *Salacia* of Lamouroux, founded on an Australian species.

17. COPPINIA, *Hassall.*

1. C. ARCTA, *Dalyell.*

Sertularia arcta, Daly. Rare and Remark. Anim. Scot., v. 1, p. 224, t. xlii.

Coppinia mirabilis, Hassall in Zoologist, No. 69, p. 2223. Trans. Micros. Soc., v. 3, p. 160, t. xxi., f. 1, 2.

Parasitical on the stems of *Sertularia abietina* and *Plumularia falcata;* frequent.

FAMILY. HYDRIDÆ, *Johnston.*

18. HYDRA, *Linnæus.*

1. H. VIRIDIS, *Linn.*

Johns. Brit. Zooph., 121, wood-cut 28.

In ponds and still waters; common.

2. H. VULGARIS, *Pallas.*

Johns. Brit. Zooph., 122, t. xxix., f. 2.

Hancock in Tynes. Club. Trans., v. 1, p. 405, t. vii.?

In ponds, &c.; rather rare. In a pond near North Elswick. —*J. A.* Crag Lake.—*A. Hancock, Esq.* In a stream of clear water at Norton.—*J. Hogg, Esq.*

* Synopsis of the Marine Invertebrata of Grand Manan, p. 9, t. i., f. 3

ORDER. ASTEROIDA, *Johnston.*

FAM. PENNATULIDÆ, *Fleming.*

19. PENNATULA, *Linnæus.*

1. P. PHOSPHOREA, *Linn.*

Johns. Brit. Zooph., 157, wood-cut 36.

From the coralline zone and deep water; frequent. Often brought in on the fishing lines at Cullercoats.

20. VIRGULARIA, *Lamarck.*

1. V. MIRABILIS, *Linn.*

Johns. Brit. Zooph., 161, t. xxx.

Dredged off the Northumberland coast by R. McAndrew, Esq., in 1851.

FAMILY. ALCYONIADÆ, *Johnston.*

21. ALCYONIUM, *Linnæus.*

1. A. DIGITATUM, *Linn.*

Johns. Brit. Zooph., 174, t. xxxiv.

From beyond low-water mark to deep water, on shells, stones, and other submerged bodies; very common.

The orange variety frequently occurs, sometimes on the same stone or shell with the common kind. As no intermediate stages have ever been found, there is a probability that this may prove to be a distinct species. Large specimens of the orange variety are generally divided into more numerous lobes or digitations, the substance is more coriaceous, and the spicula are somewhat stouter than in the other kind. The difference of colour also extends to the interior. Is the *A. glomeratum* of Hassall distinct from this? Another variety, almost white, spreading in a thin layer over other substances, and with the polypes more distant than usual, is sometimes met with. The margin of this is very much attenuated, and spreads for a considerable distance without polypes, which is not the usual character of young encrusting individuals of *A. digitatum.*

ORDER HELIANTHOIDA, *Johnston.*

FAMILY. ACTINIADÆ, *Gray.*

22. ACTINIA, *Linnæus.*

* *Actinia*, Gosse.

1. A. MESEMBRYANTHEMUM, *Ellis* and *Solander.*

Johns. Brit. Zooph., 210, t. xxxvi., f. 1—3.

On rocks and stones between tide-marks; common.

* * *Sagartia*, Gosse.

2. A. TROGLODYTES, *Johns.*

Johns. Brit. Zooph., 216, wood-cut 47.

In crevices of rocks between tide-marks; not rare. Berwick Bay.—*Dr. Johnston.* Cullercoats.—*Mr. R. Howse.*

3. A. PELLUCIDA, *n. sp.*

Body cylindrical; sub-conic or nearly flat when contracted, spreading at the base; tentacles thirty or upwards, set in about three rows, the inside ones longest; the outer rather short; the whole animal pellucid white, without markings. Diameter $\frac{1}{4}$ inch.

On old crusted shells of *Fusus antiquus* from deep water, Cullercoats.—*J. A.* From the five-men boats.—*Mr. R. Howse.*

This little Actinia, which is distinguished by the absence of all colour or markings, has occurred to me two or three times at Cullercoats, on old shells, nestling amongst the serpulæ and barnacles with which they were covered. It is so inconspicuous, when contracted, as to elude observation, and it was not till the shells had been some time in sea-water, and the Actinia became expanded, that its presence was detected. A specimen kept in a vase was very restless, shifting its place continually, and often changing form. The species comes near to the *A. candida* of Mr. Gosse, but, perhaps, nearer still to the *A. pallida*, described in a recent number of the "Annals of Natural History," by Mr. Holdsworth. The absence of the markings at the base of the tentacles, which appear to form a distinguishing character in these two species, has induced me to consider it distinct from either.

Its smaller size and deep-water habitat strengthen this view. Mr. Howse, however, informs me that he has met with it of rather larger size than above described, and occasionally with a few opaque white lines. These may be occasioned by the edges of the septa appearing through.

* * * *Bunodes*, Gosse.

4. A. CORIACEA, *Cuv.*

Johns. Brit. Zooph., 224, t. xxxix., f. 1, 2.

In rock-pools and crevices of rocks, near low-water mark; common.

5. A. CRASSICORNIS, *Müller.*

Johns. Brit. Zooph., 226, t. xl.

On shells, stones, &c., from deep water; frequent.

6. A. DIGITATA, *Müller.*

Müll. Zool. Dan., v. 4, p. 16, t. cxxxiii.

On shells from deep water; apparently not rare.

This Actinia was first distinguished on our coast by Mr. R. Howse, who procured it from the deep-water fishing boats, and I have since got it occasionally from the same source, and once or twice at Cullercoats. It is very coriaceous and warty, from an inch to an inch and a-half in diameter, of a scarlet-orange colour with paler warts; and with numerous stout tentacles of a dull red, unbanded, but a little darker towards the tips.

* * * * *Actinoloba*, Blainville.

7. A. DIANTHUS, *Ellis*,

Johns. Brit. Zooph., 233, t. xliii.

On stones and shells from deepish water, occasionally brought in by the fishing boats. Mr. Henry Bell and Mr. R. Howse have found it at low-water mark at Marsden.

23. ANTHEA, *Johnston.*

1. A. TUEDIÆ, *Johns.*

Johns. Brit. Zooph., 242, wood-cut 53.

In deep water, Berwick Bay; rather rare.—*Dr. Johnston.* Cullercoats.—*J. A.* Hartlepool; occasionally.—*J. Hogg, Esq.*

Two or three entire specimens only have been met with at Cullercoats, but separate tentacles, which appear to be very readily detached, are frequently brought in on the fishing lines.

24. LUCERNARIA, *Müller.*

1. L. AURICULA, *Fab.*

Johns. Brit. Zooph., 246, wood-cuts 54, 55.

On the lesser sea-weeds, in pools near low-water mark, Cullercoats and Tynemouth; not rare.

2. L. CAMPANULATA, *Lamx.*

Johns. Brit. Zooph., 248, wood-cut 56.

On sea-weeds, near low-water mark; rare. Berwick Bay.—*Dr. Johnston.* Cullercoats and Whitley.—*A. Hancock* and *J. A.*

CLASS. POLYZOA, *J. V. Thompson.*

ORDER. INFUNDIBULATA, *Gervais.*

SUB-ORDER. CYCLOSTOMATA, *Busk.*

FAMILY. TUBULIPORIDÆ, *Johnston.*

25. TUBULIPORA, *Lamarck.*

1. T. PATINA, *Lamk.*

Johns. Brit. Zooph., 266, t. xlvii., f. 1—3.

On corallines from deepish water; frequent.

2. T. HISPIDA, *Flem.*

Johns. Brit. Zooph., 268, t. xlvii., f. 9—11.

On *Plumularia falcata*, *Carbasea papyrea*, &c.; not rare.

The variety β Johns. (*T. orbiculus*, Lamk.) is the form usually met with.

3. T. PENICILLATA, *Fab.*

Johns. Brit. Zooph., 270, t. xlviii., f. 1, 2.

Very rare; Tynemouth. Three specimens have been obtained from shell-sand.

4. T. FLABELLARIS, *Fab.*

Johns. Brit. Zooph., 274, t. xlvi., f. 5, 6.

On *Fusus Novegicus*, from deep water; rare.

5. T. SERPENS, *Linn.*

Johns. Brit. Zooph., 275, t. xlvii., f. 4—6.

On other zoophytes, shells, &c., from deepish water; common.

A very pretty variety is sometimes found with the branches radiating from a centre in a flower-like form. This appears to be the *T. lobulata* of Hassall.

26. DIASTOPORA, *Lamouroux.*

1. D. OBELIA, *Johns.*

Johns. Brit. Zooph., 277, t. xlvii., f. 7, 8.

On *Modiola vulgaris* from deep water; frequent.

27. ALECTO, *Lamouroux.*

1. A. MAJOR, *Johns.*

Johns. Brit. Zooph., 281, t. xlix., f. 3, 4.

On *Modiola vulgaris*, and other shells, from deep water; not common.

2. A. DILATANS, *Johns.*

Johns. Brit. Zooph., 281, t. xlix., f. 5—8.

On an old bivalve (*Tellina crassa*), from deep water, Northumberland coast.—*Profr. W. King.*

FAMILY. CRISIADÆ. *Milne Edwards.*

28. CRISIA, *Lamouroux.*

1. C. EBURNEA, *Linn.*

Johns. Brit. Zooph., 283, t. l., f. 3, 4.

On other zoophytes, and on sea-weeds, from low-water mark to deep water; common.

2. C. DENTICULATA, *Lamk.*

Johns. Brit. Zooph., 284, t. l., f. 5, 6.

Berwick Bay.—*Dr. Johnston.* Cullercoats.—*J. A.*

29. CRISIDIA, *Milne Edwards.*

1. C. CORNUTA, *Linn.*

Johns. Brit. Zooph., 287, t. l., f. 1, 2.

On other zoophytes from deep water. Cullercoats; rather

rare.—*J. Coppin, Esq.*, and *J. A.* Common on the south coast of Durham.—*J. Hogg, Esq.*

SUB-ORDER. CHEILOSTOMATA, *Busk.*

FAMILY. EUCRATEIDÆ, *Johnston.*

30. EUCRATEA, *Lamouroux.*

1. E. CHELATA, *Linn.*

Johns. Brit. Zooph., 288, wood-cut 64.

Scruparia chelata, Busk, Catal., 29, t. xvii., f. 2.

Parasitical on small sea-weeds, and on other zoophytes, between tide-marks and a little beyond. Bamborough; common.—*J. A.* Berwick Bay.—*Dr. Johnston.* Cullercoats.—*J. Coppin, Esq.* South coast of Durham; rare. —*J. Hogg, Esq.*

This pretty little zoophyte, which is rare at Cullercoats, and on the coast near the mouth of the Tyne, is plentiful and very fine at Bamborough, where scarcely any of the small algæ or zoophytes can be taken from the tide-pools, on which tufts of the *Eucratea* may not be found.

31. ANGUINARIA, *Lamarck.*

1. A. SPATULATA, *Lamk.*

Johns. Brit. Zooph., 290, t. l., f. 7, 8.

Ætea anguina, Busk, Catal., 31, t. xv., f. 1.

On Corallines and Fusi on the south coast of Durham; occasionally.—*J. Hogg, Esq.*

FAMILY. GEMELLARIADÆ, *Busk.*

32. GEMELLARIA, *Savigny.*

1. G. LORICULATA, *Linn.*

Johns. Brit. Zooph., 293, t. xlvii., f. 12, 13.

Very abundant in the coralline zone.

Two varieties of this species occur. The one rather more rigid, darker coloured, and with the branches shorter and more numerous than the other, which is very flacid, pale, and with the terminal branches much attenuated. The former appears to be the kind figured by Dr. Johnston, but the latter is more common.

FAMILY. CELLEPORIDÆ, *Johnston.*

33. CELLEPORA, *Fabricius.*

* Compact.

1. C. PUMICOSA, *Linn.*

Johns. Brit. Zooph., 295, t. lii., f. 1—3.

On the stems of other zoophytes, on stones and shells, and on the roots and stems of *Laminariæ*, from beyond low-water mark to deep water; common.

2. C. HASSALLII, *Johns.*

Lepralia Hassallii, Johns. Brit. Zooph., 304, t. liv., f. 3.

Cellepora Hassallii, Busk, Catal., 86, t. cix., f. 4—6.

On the stems and roots of *Laminariæ* and other sea-weeds, between tide-marks, Bamborough—*J. A.*

* * Branching.

3. C. RAMULOSA, *Linn.*

Johns. Brit. Zooph., 296, t. lii., f. 4, 5.

In deep water, attached to shells; frequent.

4. C. SKENEI, *Ellis* and *Solander.*

Johns. Brit. Zooph., 297, t. lii., f. 6—8.

In deep water, attached to shells and zoophytes; rather rare. According to the recent researches of Professor Busk, this ought to be considered an *Eschara.*

5. C. CERVICORNIS, *Ellis* and *Solander.*

Johns. Brit. Zooph., 298, t. liii.

Eschara cervicornis. Busk, Catal., 92, t. cix., f. 7, and t. cxix. f. 1. Johns. in Berw. Club Proc., v. 3., p. 175.

In deep water, Embleton Bay.—*R. Embleton, Esq.*

This species is somewhat intermediate between *Cellepora* and *Eschara*, showing the characters of the latter genus in the young branches. The genera appear to run into each other and should be placed together. The order of arrangement in "British Zoophytes" is here adopted for convenience of reference.

Family. MEMBRANIPORIDÆ, *Busk.*

34. LEPRALIA, *Johnston.*

1. L. Brongniartii, *Aud.*

Lepralia tenuis, Johns. Brit. Zooph., 303, t. liv., f. 2.

Lepralia Brongniartii, Busk, Catal., 65, t. lxxxi., f. 1—5.

Rare. On a stone from deep water; Cullercoats.—*J. A.*

2. L. reticulata, *J. Macg.*

Johns. Brit. Zooph., 317, t. lv., f. 10.

Busk, Catal., 66, t. xc., f. 1; t. xciii., f. 1, 2; and t. cii., f. 1.

On *Fusi*, *Modiolæ*, and other shells from deep water; not rare. Cullercoats.

3. L. concinna, *Busk.*

Busk, Catal., 67, t. xcix.

On *Fusus Norvegicus* from the deep-water boats; rare.

4. L. verrucosa, *Esper.*

Johns. Brit. Zooph., 316, t. lvi., f. 3.

Busk, Catal., 68, t. lxxxvii., f. 3, 4, and t. xciv., f. 6.

On stones, shells, and the roots of *Laminariæ*, between tide-marks; frequent. Common at Bamborough.

5. L. unicornis, *Johns.*

Johns. Brit. Zooph., 320, t. lvii., f. 1.

Busk in Journ. Micros. Sc., v. iv., p. 309, t. xvi., f. 3, 4?

Lepralia spinifera, Busk, Catal., 69 (part), t. lxxx., f. 5—7.

On the under side of stones in tide-pools; frequent at Cullercoats. Rare in deep water.

The beautiful silvery-white variety mentioned by Dr. Johnston is the one usually met with. Professor Busk, who united this species with *L. spinifera*, in his British Museum Catalogue, has since separated them again in the Journal of Microscopical Science.

6. L. TRISPINOSA, *Johns.*

Johns. Brit. Zooph., 324, t. lvii., f. 7.

Busk, Catal., 70, t. lxxxv., f. 1, 2; t. xcviii.; and t. cii., f. 2.

Common on shells and stones from deep water.

A very curious variety of this species is sometimes found completely covering a shell of *Fusus antiquus* with a thickish yellow crust, swelling up at pretty regular intervals into little bosses or tubercles. The cells in these parts are irregularly heaped together, and often rise perpendicularly, somewhat in the manner of a *Cellepora.*

7. L. COCCINEA, *Abildg.*

Johns. Brit. Zooph., 322, t. lvii., f. 2, 3.

Busk, Catal., 70, t. lxxxviii.

On the roots of *Laminaria digitata*, on stones, &c., at and beyond low-water mark; frequent.

8. L. LINEARIS, *Hassall.*

Johns. Brit. Zooph., 308, t. liv., f. 11.

Busk, Catal., 71, t. lxxxix., f. 1—3.

On shells and stones from deep water; common.

9. L. CILIATA, *Linn.*

Johns. Brit. Zooph., 323, t. lvii., f. 4, 5.

Busk, Catal., 73, t. lxxiv., f. 1, 2, and t. lxxvii., f. 3—5.

On stones and shells from low-water mark to deep water, but not common. Frequent on the littoral variety of *Modiola vulgaris* at Bamborough.

10. L. VARIOLOSA, *Johns.*

Johns. Brit. Zooph., 317, t. lv., f. 8, 9.

Busk, Catal., 75, t. lxxiv., f. 3—5, and t. lxxv.

On stones from the coralline zone; rather rare. Cullercoats.

11. L. NITIDA, *Fab.*

Johns. Brit. Zooph., 319, t. lv., f. 11.

Busk, Catal., 76, t. lxxvi. f. 1.

Rare. "Berwick Bay* on *Patella cærulea*."—*Dr. Johnston.*

12. L. BISPINOSA, *Johns.*

Johns. Brit. Zooph., 326, t. lvii., f. 10.

Busk, Catal., 77, t. lxxx., f. 1—4.

"On *Modiola vulgaris* from Berwick Bay."—*Dr. Johnston.*

13. L. PEACHII, *Johns.*

Johns. Brit. Zooph., 315, t. lv., f. 5, 6.

Busk, Catal., 77, t. lxxxii., f. 4, and t. xcvii.

Lepralia immersa, Johns. Brit. Zooph., 325, t. lvii., f. 8.

Common on stones and shells from near low-water mark to deep water. The variety *immersa* is more frequent in deep water.

14. L. VENTRICOSA, *Hassall.*

Johns. Brit. Zooph., 305, t. liv., f. 5.

Busk, Catal., 78, t. lxxxii., f. 5, 6; t. lxxxiii, f. 5; and t. xci., f. 5, 6.

On *Fusus antiquus* from deep water; rare. Cullercoats.—*J. A.*

15. L. PUNCTATA, *Hassall.*

Johns. Brit. Zooph., 312, t. lv., f. 1.

Busk, Catal., 79, t. xc., f. 5, 6; t. xcii., f. 4; and t. xcvi., f. 3.

On the underside of stones in tide-pools; common. Rare in deep water.

* Dr. Johnston considered Berwick Bay to extend southwards to Bamborough: species to which this locality are assigned may, therefore, be fairly considered within the limits of our Catalogue.

16. L. PALLASIANA, *Moll.*

Lepralia pediostoma, Johns. Brit. Zooph., 315, t. lv., f. 7.
Lepralia Pallasiana, Busk, Catal., 81, t. lxxxiii., f. 1, 2.

On stones and shells between tide-marks, Bamborough and Cullercoats; rather rare.

17. L. MALUSII, *Aud.*

Lepralia biforis, Johns. Brit. Zooph., 314, t. lv., f. 4.
Lepralia Malusii, Busk, Catal., 83, t. ciii., f. 1—5.

On shells and stones from deep water; occasionally. Holy Island and Cullercoats.

18. L. GRANIFERA, *Johns.*

Johns. Brit. Zooph., 309, t. liv., f. 7.
Busk, Catal., 83, t. lxxvii., f. 2, and t. xcv., f. 6, 7.

"On slaty rocks, in front of the coves of Holy Island, and in Berwick Bay."—*Dr. Johnston.* On *Modiola vulgaris*, between tide-marks at Bamborough; not rare.—*J. A.*

19. L. HYALINA, *Linn.*

Johns. Brit. Zooph., 301, t. liv., f. 1.
Busk, Catal., 84, t. lxxxii., f. 1—3; t. xcv., f. 3—5; and t. ci., f. 1, 2.

Very common on the roots and stems of *Laminaria digitata* and other *Fuci*, on stones, &c., between tide-marks, and in shallow water.

35. MEMBRANIPORA, *Blainville.*

1. M. MEMBRANACEA, *Linn.*

Flustra membranacea, Johns. Brit. Zooph., 348, t. lxvi., f. 1—3.
Membranipora membranacea, Busk, Catal., 56, t. lxviii., f. 2.

On the fronds of *Laminaria digitata* and other sea-weeds; common.

2. M. PILOSA, *Linn.*

Johns. Brit. Zooph., 327, t. lvi., f. 6.
Busk, Catal., 56, t. lxxi.

Investing the stems of small sea-weeds, on Laminariæ, shells, &c., between tide-marks, and in shallow water; very abundant. More rare in deep water.

3. M. LINEATA, *Linn.* Pl. X., fig. 1, 1*a*.

Cells oval; the margin with 4 or 5 spines on each side, bending inwards, generally rather slender and not flattened at the sides. Ovicapsule large, galeate, slightly frosted, with an arched rib near the top. Avicularia subsessile or a little elevated, situated on one or both sides of the ovicapsule, more rarely at the top; and sometimes at the bottom of the cell.

Flustra lineata, Linn. Syst. Nat., 12th Ed., 1301.
„ Johns. Brit. Zooph., 349 (part).
Membranipora lineata, Busk, Catal., 58, t. lxi.

On shells, &c., from within tide-marks to deep water; common. Frequent on *Patella laevis*.

It is difficult to say whether this is the *Flustra lineata* of Linnæus, or whether, as is probable, he included more than one species under that name; but as he mentions only 8 spines, and the allied species, as here distinguished, have more, this may fairly be taken as the type, the more especially as it is certainly the *M. lineata* of Professor Busk, the only author whose figure can be recognised with certainty.

4. M. SPINIFERA, *Johns.* Pl. X., fig. 2, 2*a*.

Cells oblong-oval; the margin with numerous stout, linear or subclavate spines, about 7 on each side, erect or leaning inwards. Ovicapsule seldom present, shallow, smooth, with two or more spines? Avicularia on the top of club-shaped spines, developed sparingly on any part of the margin of the cell.

Flustra spinifera, Johns. in Newc. N. H. S. Trans., v. 2, p. 266, t. ix., f. 6.
Flustra? lineata, Johns. Brit. Zooph., 349 (part).

On the under side of stones between tide-marks; frequent. More rarely in shallow water.

This species was described by Dr. Johnston, under the above name, in the Transactions of the Newcastle Natural History Society, but he afterwards united it with the *Flustra lineata* in his "British Zoophytes." It appears, however, to have well marked distinguishing characters. It spreads over stones in yellowish brown, coriaceous or slightly calcareous patches, of irregular outline and thickly set with spines. Old specimens are often a good deal obscured by grains of sand, or other extraneous substances. The cells are closely set, and more elongated than in *M. lineata*, and the spines, which are frequently opaque, are stouter and more numerous. But what more particularly distinguishes *M. spinifera* is that some of the spines bear an avicularium near the top. Such spines are more or less broadly clavate or fusiform, with a pointed apex, below which, on one side, is the avicularium, with a mandible opening downwards; sometimes it is on the extreme apex. This peculiarity appears to have hitherto escaped notice. The avicularia are rather rare, but may generally be detected on some part of a specimen that has not been injured. They adhere less closely than the other spines, and are more readily rubbed off. The ovicapsules are seldom developed, and when present are so inconspicuous as to be with difficulty recognised. They appear to be smooth and very shallow, with a rib across the front, and two or more spines on the top.

5. M. CRATICULA, *n. sp.* Pl. X., fig. 3, 3*a*.

Cells in linear series, small, oval; the margin with 5 to 7 spines on each side, which are shining, flattish at the edges, and lie closely over the aperture; one or two of the uppermost spines are erect, long, and cylindrical. Ovicapsule rather small, smooth, and cylindrico-globose, with a rib across the middle. An avicularium generally at the top of the ovicapsule, sometimes at its side.

Flustra lineata, Couch, Corn. Fauna, part 3, p. 124, t. xxii., f. 15?

On *Modiolæ* from deep water; occasionally.

This beautiful little species is smaller than the two last, and resembles a good deal some specimens of *Lepralia nitida*. It is probable, therefore, that Dr. Johnston had this form in view when he expressed a doubt of the distinctness of *M. lineata* from that *Lepralia*. The spines in this are a little flattened at the sides and glistening, like the ribs of *L. nitida;* but they, as well as the cells, are smaller than in that species, and want the mid-rib, that unites the whole into regular cell-walls. The lower spines lie close to the aperture, and converge to a point near the centre of the cell. It is distinguished from *M. lineata*, as restricted above, by the smaller size and linear arrangement of the cells, by the stouter, flatter, and more recumbent spines, and by the smaller and more cylindrical ovicapsules.

The only specimens I have procured on this coast are from deep water, but Mr. Barlee has sent me a specimen beautifully developed on a small littoral sea-weed.

6. M. Flemingii, *Busk*. Pl. X., fig. 4.

Cells ovate, broad below, with a granulated margin, partially filled in by a corneous or subcalcareous expansion, leaving a triangular aperture; spines long, 3 on each side, confined to the upper half of the cell. Ovicapsule smallish, globular, slightly frosted, generally with an arched rib near the top. Avicularia numerous, dispersed, usually one on each side of the ovicapsule, sometimes one above it, and frequently one below the aperture of the cell.

Membranipora membranacea, Johns. Brit. Zooph., 328 (part).

Membranipora Flemingii, Busk, Catal., 58, t. lxi., f. 2, and t. lxxxiv., f. 4—6.

On shells, stones, *Flustræ*, &c., from between tide-marks to deep water; common.

When developed in a sheltered situation, this species appears bristling with long spines, and is then readily recognised; but in exposed situations, and more especially in deep water, the spines are frequently wanting. In this condition it may, however, be known by the expansion which partially fill in the cells. In

deep-water specimens, this expansion is often calcareous and granulated, but more frequently it is smooth, and has a semi-transparent corneous texture. The avicularia are numerous and very variable in position, but there is generally a large one on each side of the ovicapsule, sloping outwards like a pair of ears.

7. M. Pouilletii, *Aud.* Pl. X., fig. 5.

Cells ovate, broadish below, rather larger than in *M. Flemingii*, and without the inner expansion; margin granulated, with a thin rim; spines 4, or sometimes 6, round the top of the cell, short, one only on each side visible below the ovicapsule. Ovicapsule large, globose or elongated, strongly granulated and occasionally perforated. Avicularia dispersed; sometimes a small one on each side of the ovicapsule.

Membranipora membranacea, Johns. Brit. Zooph., 328 (part)?

Membranipora Pouilletii, Audouin (Expl. I., p. 240), Savigny, Egypt, t. ix., f. 12.

On shells and zoophytes, especially on *Flustra foliacea;* frequent.

This species is distinguished from the last principally by negative characters. Though not quite so common as *M. Flemingii*, it is far from rare. Both are sometimes found together on *Flustra foliacea*, overlapping each other, but not intermingling. In this case a comparison between the two can readily be made. *M. Pouilletii* is distinguished by the larger size of its ovicapsules, which are more strongly frosted or granulated than in *M. Flemingii*, and often a good deal elongated; by the partial absence of spines, and by the entire absence of the expansion partly filling up the cell, which is so peculiar a feature in the latter species. For the name, and the reference to Savigny's work, I am indebted to Professor Busk, who has also kindly sent me a tracing of Savigny's figure, which fully warrants the identification.

8. M. unicornis, *Flem.* Pl. X., fig. 6.

Cells stout, oval; the margin granulated, with 2 spines

on each side near the top, one of which is usually covered by the ovicapsule. Ovicapsule subcylindrical, smooth, with a strong rib above the margin, and surmounted by a conical avicularium.

Flustra unicornis, Flem. Brit. Anim., 536.

Membranipora membranacea, Johns. Brit. Zooph., 328 (part)?

Lepralia squama, Daly. Rare and Rem. Anim. Scot., v. 2, p. 79, t. xxv., f. 14, 15.

On old bivalve shells, on stones, and on the test of *Ascidia sordida*; frequent.

Dr. Fleming's description of his *F. unicornis* agrees so well with this species that I have no hesitation in adopting the name, although, as is the case in most of the old descriptions of this difficult genus, more than one species may have been included under it. *M. unicornis* has the cells larger, stouter, and more regularly oval than in the two last, and wants the inner sub-corneous expansion of *M. Flemingii*. But the best distinguishing character is found in the ovicapsules, which, in this species, are smooth (never frosted), have a strong rib just above the margin, and are surmounted by a conical avicularium, giving the whole the appearance of a Phrygian bonnet. When the ovicapsule is absent, the avicularium appears as "a blunt, hollow, conical process" above the cell. I have never seen an avicularium developed in any other position in this species, as is usual in its congeners.

36. FLUSTRELLA, *Gray*.

1. F. HISPIDA, *Fab.*

Flustra hispida, Johns. Brit. Zooph., 363, t. lxvi., f. 5.

Flustrella hispida, Gray, Radiated Anim. Brit. Mus., 108.

On *Fucus serratus* and other sea-weeds between tide-marks, and occasionally on stones; common.

Family. CELLULARIADÆ, *Busk.*

37. CELLULARIA, *Pallas.*

1. C. ciliata, *Linn.*

Johns. Brit. Zooph., 335, t. lviii., f. 1, 2.

Bicellaria ciliata, Busk, Catal., 41, t. xxxiv.

On corallines and Fuci; rare. South coast of Durham.—*J. Hogg, Esq.*

2. C. ternata, *Ellis* and *Solander.*

Johns. Brit. Zooph., 335, t. lix.

Menipea ternata, Busk, Catal., 21, t. xx., f. 3—5.

On other zoophytes from the deep-water (five-men) boats; occasionally.—*J. A.* Cullercoats; rare.—*J. Coppin, Esq.*, and *J. A.*

3. C. scruposa, *Linn.*

Johns. Brit. Zooph., 336, t. lviii., f. 5, 6.

Scrupocellaria scruposa, Busk, Catal., 25, t. xxii. f. 3, 4.

Parasitical on other zoophytes, Laminariæ, shells, &c., from within tidal range to deep water; common.

4. C. scrupea, *Busk.*

Scrupocellaria scrupea, Busk, in Ann. Nat. Hist., 2nd Ser., v. 7, p. 83, t. ix., f. 11, 12. Catal., 24, t. xxi., f. 1, 2.

From the deep-water boats, a single small specimen.—*J. A.*

5. C. reptans, *Linn.*

Johns. Brit. Zooph., 337, t. lviii., f. 3, 4.

Canda reptans, Busk, Catal., 26, t. xxi., f. 3, 4.

On *Flustra foliacea* and other zoophytes, on Fuci and stones, from within tide-marks to deep water; frequent.

6. C. Peachii, *Busk.*

Cellularia neritina, var., Johns. Brit. Zooph., 340.

Cellularia Peachii, Busk, Catal., 20, t. xxvii., f. 3—5.

From the five-men boats; rare.—*J. A.* "Tynemouth. *(C. neritina)*, Miss Ellen Forster."—*Johnston.*

38. BUGULA, *Oken.*

1. B. AVICULARIA, *Linn.*

Cellularia avicularia, Johns. Brit. Zooph., 338, t. lxiii., f. 7, 8.

Bugula avicularia, Busk. Catal., 45, t. liii.

On shells and zoophytes from deep water; occasionally.

2. B. FLABELLATA, *(J. V. Thompson, MS.) Gray.*

Flustra avicularis, Johns. Brit. Zooph., 346, t. lxiii., f. 3, 4.

Flustra capitata, Hogg, Nat. Hist. Stockton, 36.

Bugula flabellata, Busk, Catal., 44, t. li., lii.

On *Flustra foliacea*, shells, &c., from the coralline zone; not rare. On rocks at extreme low-water mark, Bamborough.

3. B. MURRAYANA, *(Bean, MS.) Johns.*

Flustra Murrayana, Johns. Brit. Zooph., 347, t. lxiii., f. 5, 6.

Bugula Murrayana, Busk, Catal., 46, t. lix.

From the fishing boats, Cullercoats; rather rare. More common from the deep-water (five-men) boats.

4. B. FASTIGIATA, *Fab.*

Polyzoary 1 to 4 inches high, stout, bushy, irregularly branched; becoming purplish or rusty red when dry: cells biserial, cylindrical, elongate, attenuated below: aperture wide above, elliptical below, with a stout, cylindrical, jointed spine at the upper and outer angle, and a denticle in front of it; no spine on the inner angle. Avicularium large, with a longish beak. Ovicapsules very shallow.

Sertularia fastigiata, Fab. Fauna Grœnl., 445.

Cellularia fastigiata, Flem. Brit. Anim., 539.

Daly. Rare and Rem. Anim. Scot., v. 1, p. 236, t. xlvi.

Cellularia plumosa, Johns. Brit. Zooph., 341, t. lxi.

In the Laminarian zone; frequent: usually found thrown up among sea-weeds. Cullercoats, common.—*J. Coppin, Esq.* Extremely abundant on the south coast of Durham.—*J. Hogg, Esq.*

This species has been hitherto confounded with the *Cellularia plumosa* of Pallas, the "Soft Feather Coralline" of Ellis, from which it is sufficiently distinct. The latter is a delicate species, of a bright buff colour when fresh, but becoming white when dried. It is a south country form, confined, for the most part, to the south and west coasts of Britain. The present is a North Sea species, found plentifully on the north-east coast of England and Scotland, and extending to Greenland and Norway. It is robust, stiffish, and rather shrubby in growth (compared by Sir J. G. Dalyell to an aged tree in miniature), and usually opaque and umber-coloured in the old stem and branches, which throw out numerous radical fibres. The living parts are nearly colourless when fresh, but in drying assume a reddish or purplish hue. The cells are more elongated and cylindrical than in *B. plumosa* (which is accurately represented in Pl. liv., f. 1—5, of Mr. Busk's Catalogue), and have the spine much stouter, more cylindrical, and nearly always with a joint at the base. The spine in *B. plumosa* is short, and more properly homologous with a small denticle, situated outside the spine, at the extreme edge of the aperture, in *B. fastigiata*, which can generally be detected when looked for, and sometimes rises into a second spine. The avicularium is much larger than in *B. plumosa*, and the ovicapsule smaller, shallower, and set at an open angle with the top of the cell. It has a rib near the margin.

In unravelling the synonyms of this species, it is necessary to pass over the *Sert. fastigiata* of Linnæus, which probably includes both kinds. In the *Sertularia fastigiata* of Fabricius, however, we recognise the present species from its purple colour and rigid mode of growth, as well as from its size. It may be allowable, therefore, to restrict the name *fastigiata* to this species, the more especially as it has been applied to the same form by most of the Scottish naturalists.

Family. FLUSTRIDÆ, *Gray.*

39. FLUSTRA, *Linnæus.*

1. F. FOLIACEA, *Linn.*

Johns. Brit. Zooph., 342, t. lxii., f. 1, 2.

Common on hard ground in a few fathoms water.

2. F. TRUNCATA, *Linn.*

Johns. Brit. Zooph., 344, t. lxii., f. 3, 4.

In the Laminarian and Coralline zones; abundant.

A variety with the ends expanded into undulating foliations, as figured by Sir John Dalyell under the name of *Flustra papyracea* (Rare and Rem. Anim. of Scotl., v. 2, t. vii.), has occurred to me once at Cullercoats. It is a curious and interesting form, arising from an abnormal growth, and the fusion of several of the terminal branchlets into one.

40. CARBASEA, *Gray.*

1. C. PAPYREA, *Pallas.*

Flustra carbasea, Johns. Brit. Zooph, 345, t. lxiii., f. 1, 2.

Carbasea papyrea, Busk, Catal., 50, t. l., f. 1—3.

From deep water; frequent.

41. ESCHARA, *Ray.*

1. E. FOLIACEA, *Ellis* and *Solander.*

Johns. Brit. Zooph., 350, t. lxvii.

From deep water, Embleton Bay; rare.—*R. Embleton, Esq.* South coast of Durham.—*J. Hogg, Esq.*

2. E. CRIBRARIA, *Johns.*

Johns. Brit. Zooph., 352, t. lx., f. 7—9.

Busk in Journ. Micros. Scien., No. 16 (1856), 311, t. xii., f. 1—3.

From the deep-water fishing boats; occasionally. Berwick Bay, in 35 fathoms.—*Dr. Johnston.* Northumberland coast.—*A. Hancock, Esq.; Prof. W. King;* and *J. A.*

The two largest specimens figured in the Journal of Microscopical Science are in the Newcastle Museum. The only British examples of this species yet known appear to have been got on our coast. Mr. A. Hancock has a small specimen on a *Margarita* from Davis' Straits.

42. RETEPORA, *Lamarck.*

1. R. Beaniana, *King.*

Johns. Brit. Zooph., 353, wood-cut 67.

From the deep-water fishing boats.—*Prof. King.* Dredged in 60 fathoms off the coast of Durham.—*Mr. R. Howse.* From deep water, Embleton Bay.—*R. Embleton, Esq.* The specimens got by Mr. Embleton are remarkably fine.

Family. SALICORNARIADÆ, *Busk.*

43. SALICORNARIA, *Cuvier.*

1. S. farciminoides, *Ellis* and *Solander.*

Johns. Brit. Zooph., 355, t. lxvi., f. 6, 7.

On shells, &c., from deep water; frequent.

2. S. sinuosa, *Hassall.*

Johns. Brit. Zooph., 356, t. lxvi., f. 8.

Dredged off Whitburn in about 20 fathoms water.

The claims of this species to be considered distinct from *S. farciminoides* have hitherto been much disputed. Dr. Johnston, though he admitted it into the second edition of "British Zoophytes," leaves the question undecided, correctly remarking, that "the real specific distinctness of the species is undetermined." Professor Busk rejected it in his "Catalogue of Marine Polyzoa," on the authority of the British Museum specimens, considering them to be typical—of which, however, there may be some doubt. The fact is, that the characters originally fixed upon to distinguish the species do not prove to be permanent, and later observers, finding these to be fallacious, have consequently rejected it. I have, therefore, found it necessary to subject both kinds to a careful re-examination. The result has

confirmed me in the belief that they are really distinct species. The best character is found in the avicularium, "the form and position of which," Mr. Busk remarks, "afford apparently an invariable character, readily discernible, and sufficient as a specific distinction."* The avicularium of *S. furciminoides* is semicircular and arched upwards; that of *S. sinuosa* is triangular, pointing downwards, and always sloping a little to one side. In addition to this, the form of the under lip of the cell differs in the two species: in *S. furciminoides* it is slightly arched in the centre; in *S. sinuosa* it is quite straight, and rather projecting, with a sinus at each end. The form of the cells, though variable, is more inclined to the rhomboidal or lozenge shape in *S. furciminoides*, and to the hexagonal or octagonal in *S. sinuosa*. The arched top is found in young specimens of both. Upon the whole I think there cannot be a doubt of the distinctness of the two species, and I am glad to find that Professor Busk now coincides with me in this opinion.

Sub-order. CTENOSTOMATA, *Busk.*

Family. ALCYONIDIADÆ, *Johnston.*

44. ALCYONIDIUM, *Lamouroux.*

1. A. GELATINOSUM, *Linn.*

Johns. Brit. Zooph., 358, t. lxviii., f. 1—3.

Attached to old shells and stones in the Laminarian and Coralline zones; frequent. On the sides of rocks at low-water mark, Bamborough.

2. A. HIRSUTUM, *Flem.*

Johns. Brit. Zooph., 360, t. lxix., f. 1, 2.

On *Corallina officinalis* and other sea-weeds between tide-marks and in shallow water; common.

At Cullercoats and on the adjacent coast, this species is of very humble growth, seldom exceeding one or two inches in height, and very slightly lobed—often, indeed, a mere crust, not rising into a free state; but in the north of Northumberland it reaches a much larger size, and becomes much lobed

* Catal. Mar. Pol., p. 16.

and palmated. At Bamborough I have obtained it five or six inches in height and nearly as much in breadth. The largest specimens appear to grow beyond low-water mark.

Dr. Johnston has, I think, made a mistake in stating that the papillæ of this species are "each the cell of a polype." They are imperforate, and much more numerous than the polype-cells, which are disposed among them in the same manner as is represented in the figure of *Cycloum papillosum*, given in "British Zoophytes" (Pl. lxx., fig. 1). This figure has the appearance of having been taken from a specimen of *A. hirsutum* in its encrusting state.

3. A. PARASITICUM, *Flem.*

Johns. Brit. Zooph., 362, t. lxviii., f. 4, 5.

On *Plumularia falcata* and other zoophytes from deepish water; common.

4. A. MAMMILLATUM, *n. sp.* Pl. VII., f. 3, 4.

Encrusting, semitransparent, brownish, covered with rather long, stout, and strongly wrinkled papillæ, from which the polypides issue: tentacles sixteen or eighteen.

On old shells from deep water; not uncommon.

When carefully examined, this species can readily be distinguished from any of those previously described by the greater size and elevation of the papillæ, which, although varying much in length according to their state of contraction, are always sufficiently prominent to be easily recognised. When most contracted, they appear like strong mammillæ, but their more usual form, when the polypide is withdrawn, is elongate-conical; when it is expanded, they are cylindrical and nearly linear. This species is parasitical on old univalve shells from deep water, which it envelopes with a subcoriaceous crust, never rising into a free state. No septa are visible excepting in the margin of young specimens, or when examined as a transparent object in the microscope.

5. A. ALBIDUM, *n. sp.* Pl. VII., figs. 5, 6.

Encrusting, semitransparent, yellowish white; general envelope inconspicuous; polypides prominent, ventricose, flask-shaped, sub-recumbent, becoming erect towards the aperture, which is truncated when contracted; tentacles, 18.

Surrounding the stem of *Plumularia falcata* in small patches; from the deep-water fishing boats; rare.—*J. A.*

This species looks somewhat like a cluster of separate animals, the polypides being prominent and united to each other by narrow septa. When the polypide is extended it is columnar, tapering a little upwards, and expanding into a slight ridge below the fasciculated sheath of setæ. It may be doubted whether the specimens examined were in an adult state.

6. A. HEXAGONUM, *Hincks.*

Alcyonidium mytili, Daly. Rare and Rem. Anim. Scot., v. 2, p. 36, t. xi.?

Alcyonidium hexagonum, Hincks, in Journ. Micros. Sc., No. 19.

On stones and shells from between tide-marks to deep water; frequent.

It is possible that more than one species may be here included under the above name. The *Alcyonidia* of our coast have been very imperfectly investigated. All that can be said at present is that one species at least, resembling in its character the *A. hexagonum* of Hincks and *A. mytili* of Dalyell, is not uncommonly met with on stones within tide-marks, as well as on shells and other substances from deep water. It has not yet been observed upon sea-weeds.

7. A. POLYOUM, *Hassall?*

Sarcochitum polyoum, Johns. Brit. Zooph., 365, t. lxxi.?

On the underside of stones in tide-pools, with the last; frequent.

This species is frequently found on the same stone with the last, from which it differs in being thicker and of more gelatinous

consistency, in its dark brown colour, and in its not having the septa visible even when dried. It answers tolerably well to the description of *Sarcochitum polyoum*, Hassall; and, therefore, in the present uncertain state of the species, I have thought it best to consider it such, rather than to introduce a new name. It does not appear to differ generically from the other encrusting *Alcyonidia;* but should it be considered necessary to divide these from the branching kinds (most of which, however, are encrusting in their young state), the name of *Sarcochitum* might be adopted for the group.

Family. VESICULARIADÆ, *Johnston.*

45. SERIALARIA, *Lamarck.*

1. S. LENDIGERA, *Linn.*

Johns. Brit. Zooph., 368, wood-cut 68.

On Fuci and zoophytes from low-water mark to deep water; not rare.

46. VESICULARIA, *J. V. Thompson.*

1. V. SPINOSA, *Linn.*

Johns. Brit. Zooph., 370, t. lxxii., f. 1—4.

"Rarely found near Hartlepool."—*J. Hogg, Esq.* Cullercoats, a single specimen.—*J. A.*

47. BUSKIA,* *nov. gen.*

Polyzoary corneous, consisting of a slender, tubular, creeping fibre, with cells developed at intervals. Cells ovate, adhering throughout, generally with lateral spine-like processes, also adhering; orifice terminal and circular. Polypide with eight tentacles, issuing from a sheath of fasciculated setæ.

1. B. NITENS, *n. sp.* Pl. VII., figs. 1, 2.

Minute, horn-coloured, shining: creeping fibre, filiform,

* This genus is dedicated to Prof. Busk, who has done more towards the illustration of the *Polyzoa* than any other individual.

branching or anastomosing, with occasional short, spinous offsets: cells ovate or flask-shaped, rather ventricose, tapering towards the orifice, the margin of which is thickened and slightly nodulous; sides of the cells produced into irregular, flattened spines, adhering to the substance on which it creeps.

On *Plumularia falcata*, *Companularia dumosa*, &c., from deep water; rather rare.—*J. A.* On a stone at low-water mark, Whitley.—*J. Coppin, Esq.*

This interesting little zoophyte has probably hitherto escaped observation from its minuteness. The processes at the sides give the cells an insect-like appearance: they are irregular and occasionally wanting. The cells are also subject to some variation in form, especially in the size of the aperture: they lie nearly parallel to the stem, which frequently divides and runs along each side of them, clasped by the lateral processes. The animal, when excerted, extends considerably beyond the cell, and has eight shortish and rather stout tentacles.

48. VALKERIA, *Fleming.*

1. V. UVA, *Linn.*

Johns. Brit. Zooph., 375.

In tide-pools, on *Corallina officinalis;* frequent.

49. BOWERBANKIA, *Farre.*

1. B. IMBRICATA, *Adams.*

Johns. Brit. Zooph., 377, t. lxxii., f. 5, 6.

β. *Bowerbankia densa*, Farre in Philos. Trans., An. 1837, p. 391, t. xx., xxi.

In tide-pools, on *Corallina officinalis;* frequent.

The *Bowerbankia* usually found on our coast is the *densa* of Farre, which, in deference to the opinion of others, is here ranked as a variety, though I am inclined to think it a distinct species. Independently of habit and mode of growth, it is difficult to get a character to distinguish the species of this genus, or of *Valkeria*. *B. densa* grows in small compact tufts in rock-pools, about half-tide level, principally on *Corallina officinalis;*

never rising from its support or sending off free shoots. At extreme low water mark, at Cullercoats, a *Bowerbankia* is found of a more lax mode of growth, sending off free shoots, and having the cells a little more elongated and slender. This I take to be a depauperated form of the true *B. imbricata*, though it never assumes the luxuriant branched state seen in south-country specimens.

50. FARRELLA, *Ehrenberg.*

1. F. PEDICILLATA, *n. sp.* Pl. VIII.

Body ovate-oblong, yellowish, transparent, with long and very slender pedicles, uniform in thickness throughout, arising from a creeping fibre; tentacles 12. Length of cell $\frac{1}{30}$th in.

On old shells of *Buccinum undatum* and *Fusus antiquus*, from deep water; not uncommon.—*J. A.*

This species differs from the *Laguncula* (*Farrella*) *elongata* of Van Beneden in the great length and slenderness of the pedicle, which is usually two or three times the length of the cell, and does not enlarge towards the top, as in the latter species. The cells are rather narrower above than in *F. elongata*, and the number of tentacles does not exceed twelve in any of the specimens that I have examined. The animal, as seen through the transparent cell-walls, is of a pale yellow colour, with a brownish red patch, indicating the position of the stomach. The ovaries are white. The base of the cell is finely wrinkled, and at its junction with the pedicle it forms a kind of joint, which can be more or less twisted at the will of the animal.

51. AVENELLA, *Dalyell.*

Body elongate-cylindrical, opaque, sessile, arising from a creeping fibre; tentacles numerous (20 to 30); gizzard?

This genus differs from its allies (*Farrella*, *Bowerbankia*, and *Valkeria*) in the opacity of its cell-walls, and in the greater number of tentacles. It also differs from *Farrella*, in being sessile.

1. A. FUSCA, *Daly.*

Dalyell, Rare and Rem. Anim. Scot., v. 2, 65; v. 1, t. xii., f. 11.

Farrella fusca, Busk, in Journ. Microsc. Sc., t. vi., f. 3.

On *Flustra truncata* and *Plumularia Catherina*, from the coralline zone, Cullercoats.—*J. A.*

This species is of an opaque ochre-yellow colour when fresh, but changes to a blackish brown by exposure to the air. The name of *fusca* does not, therefore, well characterise it in its living state. The tentacles (20 in number) have an opaque white line down the centre.

SUB-ORDER. PEDICELLINEA, *Gervais.*

FAMILY. PEDICELLINIDÆ, *Johnston.*

52. PEDICELLINA, *Sars.*

1. P. ECHINATA, *Sars.*

Johns. Brit. Zooph., 382, t. lxx., f. 5.

On small sea-weeds and corallines, near low-water mark; frequent.

A minute *Pedicellina* with a smooth stem, apparently distinct from this, was observed on a stone from a tide-pool at Cullercoats. It is probably the *P. gracilis* of Sars, but from its position and small size, its characters could not be distinctly ascertained.

ORDER. HIPPOCREPIA, *Gervais.*

FAMILY. PLUMATELLIDÆ, *Allman.*

53. ALCYONELLA, *Lamarck.*

1. A. STAGNORUM, *Lamk.*

Johns. Brit. Zooph., 391, t. lxxiv.

In Howick pond.—*R. Embleton, Esq.* Crag Lake.—*A. Hancock, Esq.*

54. PLUMATELLA, *Bosc.*

1. P. REPENS, *Linn.*

Johns. Brit. Zooph., 402, wood-cut 76.

Not unfrequent in a rivulet of beautifully clear water, at Norton, near Stockton: observed in 1837.—*J. Hogg, Esq.*

2. P. PUNCTATA, *Hanc.*

Hancock, in Ann. Nat. Hist., 2nd Ser., v. 5, p. 200; and Trans. Tynes. Club, v. 1, p. 400, t. vi., f. 6, 7, and t. iv., f. 1.

In Bromley and Crag Lakes, Northumberland.—*A. Hancock.*

3. P. ALLMANI, *Hanc.*

Hancock, in Ann. Nat. Hist., 2nd Ser., v. 5, p. 200; and Trans. Tynes. Club, v. 1, p. 401, t. vi., f. 3—5; and t. iv., f. 2, 3.

In Bromley Lake; rather abundant.—*A. Hancock.*

55. FREDERICELLA, *Gervais.*

1. F. SULTANA, *Blum.*

Johns. Brit. Zooph., 405. Hanc. in Trans. Tynes. Club., v. 1, p. 368, t. iii., f. 1, 4—6.

In Crag and Bromley Lakes; abundant.—*A. Hancock.*

FAMILY. PALUDICELLIDÆ, *Allman.*

56. PALUDICELLA, *Gervais.*

1. P. PROCUMBENS, *Hanc.*

Hancock in Ann. Nat. Hist., 2nd Ser., v. 5, p. 201; and Trans. Tynes. Club, v. 1, p. 402, t. vi., f. 1, 2.

In Bromley and Crag Lakes, but more abundantly in the latter.—*A. Hancock.*

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ABBREVIATIONS OF AUTHORS' NAMES.

Abildg. .....Abildgaart, in Zoologia Danica.
Aud. .....Audouin, in Savigny's Egypt.
Blum. .....Blumenbach.
Cuv. .....Cuvier.
Daly. .....Dalyell.
Ehr. .....Ehrenberg.
Fab. .....O. Fabricius.
Flem. .....Fleming.
Forsk. .....Forskal.
Hanc. .....A. Hancock.
Hass. .....Hassall.
Johns. .....Johnston.
Lamk. .....Lamarck.
Lamx. .....Lamouroux.
Linn. .....Linnæus.
Müll. .....Müller.
Macg. .....J. Macgillivray.
Van. Ben. .....Van Beneden.

EXPLANATION OF THE PLATES.

Plate III.

Figs. 1, 2. *Vorticlava humilis*, natural size and magnified.
3. A tentacle of the lower row, much enlarged.
4. Ditto of the upper row ditto.
5, 6. *Eudendrium confertum*, natural size and magnified.
7. A polypary of the same, magnified.
8. A tentacle, contracted and very highly magnified.
9, 10. *Eudendrium capillare*, natural size and magnified.
11. A polype of the same, more highly magnified.
12. Reproductive capsule (sperm-capsule?), more highly magnified.

Plate IV.

Figs. 1, 2. *Sertularia tricuspidata*, natural size and magnified.
3, 4. *Sertularia tenella*, natural size and magnified.
5. Ovicapsule of the same.
6. A polype-cell, showing the operculum.
7. *Campanularia volubilis*, highly magnified.
8. *Campanularia Johnstoni*, ditto.
9. *Campanularia Hincksii*, ditto.

Plate V.

Figs. 1, 2. *Laomedea neglecta*, natural size and magnified.
3. A cell of *Laomedea gelatinosa*, Pallas.
4. Two cells of *Laomedea longissima*, Pallas.
5. *Laomedea acuminata*, natural size.
6, 7. The same, highly magnified, with the polype in different states of expansion.
8. The same with the polype withdrawn.

Plate VI.

Fig. ... 1. *Grammaria ramosa*, natural size.
2. Another specimen, magnified.
3. A portion of the same, more highly magnified.
4. A section of the stem of the same.
5. *Campanularia gracillima*, natural size.
6. A portion of the same, magnified.

Plate VII.

Fig. ... 1. *Buskia nitens*, highly magnified.
2. Two cells of the same, the upper one showing the sheath of setæ.
3, 4. *Alcyonidium mammillatum*, natural size and magnified.
5, 6. *Alcyonidium albidum*, natural size and magnified.

Plate VIII.

Fig. ... 1. *Farrella pedicellata*, highly magnified.
2. A cell, more highly magnified.
3. The same, with the tentacles expanded.

Plate IX.

Figs. 1, 2. *Coryne (pelagica)*, natural size and magnified.
3. A group of *Tubularia implexa*, natural size.
4. A single polypary of the same, slightly magnified.
5. The same, highly magnified.
6. A portion of the same, showing the two coats of the tube.
7, 8. *Corymorpha nana*, natural size and magnified.

Plate X.

Fig. ... 1. *Membranipora lineata*, a few cells highly magnified, 1*a*, a spine.
2. ——— *spinifera*, ditto 2*a*, two spines, one bearing an avicularium.
3. ——— *craticula*, a few cells highly magnified, 1*a*, a spine from the lower part of the cell.
4. ——— *Flemingii*, highly magnified.
6. ——— *unicornis*, ditto.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ AT THE ELEVENTH ANNIVERSARY MEETING, HELD ON SATURDAY, APRIL, 4, 1857. BY JOHN HOGG, ESQ., M.A., F.R.S., F.L.S., F.C.P.S., &c., PRESIDENT.

GENTLEMEN—In taking the chair at this Eleventh Anniversary Meeting of the Tyneside Naturalists' Society, allow me to offer to you my warmest thanks for the honour you have conferred upon me, during the past year, of being your President.

In accordance with the annual custom, I have now, as your chief—who am about to resign the agreeable duties which attend upon that office to another and a more able head—the pleasure of making a few remarks upon some of the discoveries, and other subjects, connected with Natural History, and of laying before you the proceedings of the Society, during the year of my office.

Many of the members present will recollect sharing with me the gratification experienced in hearing a very important and interesting paper upon the Zoophytes discovered on the coasts of Northumberland and Durham, which was read to us, by one of our Vice-Presidents, Mr. Joshua Alder, at our last Anniversary Meeting, on May 15.

This paper, in addition to its having been written with the usual care and accuracy of that distinguished Naturalist, was illustrated by some well executed drawings. In it, the enumeration of the species, amounting to 164, including some new forms of the Zoophytes which have been found on our coasts up to the present time, will, I am certain, prove very complete and valuable.

Having myself formerly—I now regret to say, full thirty summers have since past and gone—paid some attention to this most engaging, though difficult branch of Natural History, I gave to the world my short, and imperfect List of *Polyparia*, or

Polypæciæ, which I had, up to the year 1825,* discovered on the southern portion of the coast of Durham.

My late eminent friend, Dr. Johnston, of Berwick, when engaged in writing his work on "British Zoophytes," obtained from me dried specimens of many rarer species which are named in that List, and also some more recent ones, which I had subsequently found near Whitburn, as well as in the vicinity of Hartlepool. Some of these were identified by Dr. Johnston, who inserted their *habitats* in his beautiful work.

Having about the same time been engaged in some researches on the *Spongilla*, and the nature of the *Spongiæ*—which are published in the "Linnean Transactions," vol. 18, I was led, from those examinations, to consider them as *vegetable* substances, in consequence of the absence of all definite and certain characters, or properties, which are admitted by all Naturalists to belong *exclusively* to an *animal*.

And, although some of our English Naturalists still retain the old idea of their *animality*—and correctly so, perhaps, with respect to some of the marine kinds—many eminent Foreign Physiologists are now satisfied that they pertain in reality to the *vegetable* kingdom. It behoves me, however, to state, that owing to the use of an old and very imperfect microscope, when employed in my investigations, I was unavoidably led into some errors, which I have subsequently corrected.

I do not here intend to resume the discussion of this question, but I will only mention to you that Mr. Carter, of Bombay, has in a recent paper,† related his having detected the presence of *starch* (amylum) in some old specimens of *Spongilla*.

"I have lately found," he writes, "that *starch* is plentifully developed in *Spongilla*, towards the end of the season, when it is about to be left uncovered by the water, and that not only are large *starch-grains* to be observed, apparently in nothing but the

* After that time, I termed what the French Naturalists called "Polypier," and in Latin, "Polyparium," *Polypæcia*, derived from πολύπους, *Polypus*, and οἰκία, *domus*, taking the well-known word παροικία, *Paræcia*,—i.e. a Parish, or "*accolarum conventus*," for my best example. Dr. Johnston subsequently used and printed the very inharmonious word *Polypidom*, which signifies precisely the same.

† See "Annals and Mag. of Nat. Hist." for February, 1856, p. 106.

intercellular substance, but that many of the cells also exhibit traces of *starch* among their greenish granular contents; and some spherical cells appear to contain nothing else but a translucent *amyliferous* fluid."

So likewise, Professor Allman, in a short notice on the endochrome (*chlorophyll*) in *Conferva Linum*, which he read at the British Association in 1853,* "proved that the green matter," or *endochrome* in that species of *conferva*, "is immediately contained in distinct cells, and that it surrounds in each cell a peculiarly formed *starch-granule*."

If, therefore, *starch*—which is so essentially a *vegetable* ingredient—be actually developed within the *Spongilla*, it would evidently confirm the *vegetability* of that sort of sponge.

In the year 1838—nearly twenty years ago—I, moreover, noticed in my paper in the "Linnean Transactions," that it was probable that some of the bodies then referred to the *Infusorian* Animalcules, would turn out, on further investigation, to be only *plants*. This, indeed, seems now to have taken place with regard to the well known *Volvox Globator*, or "Globe Animal;" for Dr. Cohn, in a communication made last autumn, to the French Academy of Sciences,† mentions that it probably belongs to the *Algæ*. He observes—each spherule within it, as in the *Gonia*, and other *Volvocineæ*, is not so much an individual, strictly so termed, as a society of individuals. The *Volvox* has two distinct methods of reproduction, which are similar to those of all *Algæ*. M. Cohn describes the reproductive globule, and the *chlorophyll* contained within it, as giving place to *starch*, and to an oil of a red or orange colour. Also, many more of the *Infusoria*, especially the *Desmidieæ*,‡ which Ehrenberg considered as *animals* of a high and complex organisation, have been proved to be *vegetables;* and these facts have been ascertained with greater accuracy by the use of the modern improved and more powerful microscopes. Some Naturalists have now classed many of the *Infusoria* under the appropriate term of *Protozoa*, or the "first animals,"

* See p. 62, "Report of the British Association," for 1853.

† Vide "Comptes Rendus," for December 1, 1856, p. 1054.

‡ Hassall, "Brit. Freshwater *Algæ*," vol. 1, p. 39, says, "Iodine demonstrates the presence of *starch*, in abundance, in the contents of their cells."

because they present the *primary* forms of *animal* life. Most of them being microscopic and extremely minute, require more skilful examinations; and as such I beg to recommend them to your special attention, to determine as far as is possible, with the aid of the best microscopic power, which really ought to be placed in the animal, and which in the vegetable, kingdom. Although, strictly speaking, in Nature there *may be no* actual distinction between these two kingdoms; and that life, in the lowest animal and that in the simplest plant, *may* be the *same*, both beings having the same properties of existence, in their receiving nourishment, in their power of increasing in size, in their propagation, as well as in their being subject to the same penalty of life—namely, *death*—still the Naturalist must endeavour to draw a line of demarcation between these two great provinces, for the sake of the arrangement and classification of the infinitely numerous living beings, or organisms, existing in the world. And, for this purpose, the clearest and most certain distinction between an animal and a vegetable seems to be the presence of a stomach, or a stomachic sac, and of a muscular apparatus in the former, and the entire absence of them in the latter.

Every one can see and determine the natural distinctions subsisting between the *two Sovereigns* of the Forest, or Vegetable Waste, the King of Northern Trees—the *Royal Oak*,

"That holds the woods in awful *Sovereignty*,"

and the King of Southern Animals—the *Noble Lion;* yet, who can perceive with certainty the true distinctions between those lowest inhabitants of "the watery waste"—the most trivial and minutest *Alga*, and the smallest animated *Infusorian?*

And, for the preservation of the minuter water plants and animals, as well fluviatile as marine, I will here name the great convenience of *glazed cases*, containing either spring or sea water, with tubes properly adapted for securing a fresh supply. These glass vessels, or tanks, have been termed *Hydrozogreia*, *Aquatic Vivaria*, or *Aquaria*, and are admirably suited to the investigation of the minuter organisms; and by being always at hand, the

observer can consult his own leisure for studying their natural habits; for detecting their modes of reproduction, and those which may undergo any metamorphosis; and for undertaking, or repeating, his microscopic examinations of them.

Man, with his confined and imperfect power of vision, must, for these minute beings, call in aid that wonderful and improved instrument, the microscope. Neither do I despair of all further improvement in that beautiful instrument; but I trust, indeed, that it may be still brought to a higher degree of perfection, both in its magnifying power and in its presenting a greater compass of light. And I look forward with great hope that means of transferring the magnified object, by the aid of photography, to paper, will be rendered more easy and more certain; and thus permanent light-pictures, representing many of the secrets of nature in her lower form, will be afforded to the Naturalist.

In having just spoken of the Royal Oak, or *Quercus robur*, as the "Sovereign" of our *northern* forest-trees, and with reference to the interesting "Abstract" of Mr. D. Oliver's paper "On the Growth in Diameter of the Dicotyledonous (*Exogenous*) Stems," published in p. 64, of our Transactions, vol. 3, pt. 2; and in relation to the breadth of, and variation in, the annual concentric zones, I beg to call your attention to a recently discovered forest-tree, which grows in the uncultivated waste of California, in North America, at an altitude of from 4,000 to 5,000 feet above the Pacific. This stupendous and gigantic tree, although an evergreen (*Conifer*), evidently deposes our northern Oak from his sovereignty of the vegetable kingdom, and stands almost unrivalled in majesty, dimensions, and height, among the trees of the forest.* This "Mammoth Tree," or *Wellingtonia gigantea*, is from 300 to 400 feet in its entire height, the diameter being more than 30 feet, and the circumference above 90 feet, at its

* The Rev. T. Ewing describes a place, which he called the "Vale of Giants," in Tasmania, where he discovered, in 1849, some enormous *Eucalypti*, or Swamp Gum Trees. The *largest* he measured, was, at a yard from the ground, 102 feet, and at the ground, 130 feet in circumference. Another he reckoned at more than 300 feet in height. (*See* p. 155, vol. 1, "Trans. of the Royal Society of Van Dieman's Land.") I believe, however, that the *Eucalyptus* is a tree of very rapid increase.

base, at which part the bark alone is given at 18 inches in thickness.

Mr. D. Oliver's investigations were made on the growth, in diameter, of the stems of Dicotyledonous (*Exogenous*) Angiosperms; whereas the *Wellingtonia* is a Dicotyledonous Gymnosperm; yet the increase of the stems in both these sections will be found to be carried on after a similar manner; and that is, by the formation year after year, of concentric zones in the wood. So it would be important to continue his mode of observation on the stem of this new tree, and to endeavour to determine other questions connected with the growth of its wood. And, indeed, we may all fully expect to witness, in a few years, the growth of this remarkable tree; for, I understand, many seedlings are promising, and will most likely be able to bear the changes in our variable climate. Now, from a computation of the concentric zones, or layers of wood, in the stem, either of an Angiospermous, or a Gymnospermous tree, the age of it may be pretty well ascertained. Report says, from such a computation of some of the "Mammoth Trees," and from a comparison of the diameters of their stems with the supposed *annual* zones, that the *largest* of those existing trees must have numbered full 3,000 years.

And this is a question worthy of some little attention. The account of the portion of the Mammoth Tree, which I saw last spring, when privately exhibited in London, gives the diameter at its base = 31 feet, and the bark at the same spot = 18 inches in thickness. But, as I do not know whether that diameter *includes* the thickness of the bark, I will conclude it does, and deduct twice the 18 inches = 36 inches = 3 feet, from the 31 feet, and call the diameter of the wood-circle = 28 feet. De Candolle estimates the increase of the *Yew* tree, in breadth of the stem, at about *one line*, or a 12th of an inch, *in a year*. On this calculation, I find that the diameter would be 336 inches = 4,032 lines, which should signify the number of years of that Mammoth Tree. Also the Editor of the "Gardener's Chronicle" states, he thinks it a fact that that tree did not exceed in growth *two* inches in diameter in twenty years, which would be 24 lines in twenty years, or 1-6th more than De Candolle's estimate; hence, this would make the age of the tree to be 3,360 years.

Agreeing with Mr. Bowman* in considering that De Candolle's reckoning, of *one* line in breadth, is *too low* for the annual growth of an *old* Yew tree, I would estimate the mean average of this individual *Wellingtonia* at one line and a half, or 30 lines in twenty years; consequently the number of years that tree had grown would amount almost to 2,690 years. Yet, as the appearance of the light wood struck me as that of a *far quicker* growing tree than a *Yew*, I am inclined to hold that my own estimate of its age is *too high*. If, then, we take its average annual growth at *double* the former, or 3 lines, or a quarter of an inch, in diameter, per annum, the age would in such case be 1,344 years—a much more likely period. This, indeed, is a physical problem, which may, from future opportunities, be solved.

Some Botanists have considered it by no means improbable that certain Exogenous trees may have been *Sovereigns* of the Forest, at the beginning of our era, more than 1,800 years ago.† Such may, in fact, have been the case with at least *two* species of trees, exclusive of the *Wellingtonia*—the one an Angiospermous Exogen, the common Oak (*Quercus robur*), and the other a Gymnospermous Exogen, the Cedar of Lebanon‡ (*Cedrus Libani*). Diodorus Siculus, who flourished about 44 B.C., writes (*Lib.* 19, *cap.* 58), that in his day Lebanon was full of Cedar trees, which were wonderful for their beauty and size. And our Poet, Mason, describing the *antiquity* of those trees on Lebanon, says :—

> ——————"Cedars there
> *Coeval* with the *sky-crown'd mountain's* self,
> Spread wide their giant arms."—(*English Garden*, Book 2.)

* *See* "Proceedings of British Association," 1836.

† Lindley, "Vegetable Kingdom," 2nd edition, p. 235.

‡ Another Gymnospermous tree, but of slow growth with us, is the *Yew*, that attains to a vast age. Mr. Bowman ("Proceedings of British Association," 1836) mentions a yew tree, in Gresford Church-yard, in North Wales, whose mean diameter was 8 feet 6 in., or 1,224 lines, which, according to De Candolle's calculation, would represent as many years. But Mr. Bowman supposed the then age of it to be 1,419 years. A larger Yew, in Darley Church-yard, having a mean diameter of 9 feet 5 in., gave, from horizontal sections, 2,006 years as its age. Of course, the *breadth* of the annual rings varies somewhat in every tree; and the quick-growing species, as Willows, Poplars, Larches, and Firs, cannot in this respect be placed on the *same* scale with Oaks, Walnuts, Spanish Chestnuts, Yews, and others of slow increase.

But on this subject, and on the annual growth of the stems of Forest trees, we have by no means yet arrived at a full and perfect knowledge.

After regarding those trees from different regions of the earth, I am naturally led to congratulate the Botanists of our Society on the publication of the most complete treatise on "Botanical Geography" that has ever appeared. The valuable work which I allude to is entitled "Géographie Botanique raisonnée,"* par *M. Alphonse de Candolle.* Wahlenberg, Von Buch, Baron Humboldt, Ramond, Robert Brown, Meyen, Dr. Hooker, H. Cottrell Watson, Grisebach, Miquel, Lecoq, and a few others, have severally done much since the first publication, in 1822-3, on this important subject by Professor Schouw, of Copenhagen. That book, under the title of "Elements of a Universal Geography of Plants," laid the foundation of our knowledge of this branch of science; and, as far as a general treatise went, it was very useful, abounding in able views, and a full selection of facts and authorities.

The subject, as recently treated by M. de Candolle, is divided into *four* books. The first may be considered as *Botanical Climatology*, or observations on the natural effects of climate; or, more strictly, on the action of temperature, of light, and of moisture upon plants. The second book relates to *Geographical Botany;* the third book to *Botanical Geography;* and the fourth book contains some *general conclusions.* There is also an *Appendix* setting forth certain investigations requisite for the advancement of Botanical Geography, and the first volume has two geographical maps exhibiting the "Polar Limits" of several species. At first sight, I must observe that it struck me that the divisions of the second and third books were unnecessary; for a full and complete consideration of the one, must evidently include the other; yet, on a further examination of these *two* books, I became more satisfied with the author's distinctions and arrangements.

The following result, with regard to the annual heat which plants require, as deduced from De Candolle's own experiments,

* The full title adds, "Ou Exposition des Faits Principaux et des Lois concernant la Distribution Géographique des Plantes de l'époque actuelle."—2 Toms. *Genève*, 1855.

which he carried on for many years, is worthy of notice, and of being remembered by us. "It is not so much a total annual average amount of heat that a plant requires to enable it to vegetate, to flower, or to ripen its seed, as that this heat shall never descend below, or ascend above certain extremes, and that it shall remain within those limits for a sufficient length of time for the completion of those operations, a period of time which may be shortened or lengthened according to the greater or less intensity of the heat received by the plant within the above limits."*

Again, it is worth pointing out that M. De Candolle seems to "support the doctrine that species of plants were successively created† at different geological periods, and in different parts of the earth; that whilst some species have survived through several geological periods, others have disappeared with the great changes that have occurred in the configuration of the surface of our globe."

He tells us, "that of the species now existing, whilst the great majority belong evidently to the earlier geological periods,‡ there is reason to believe that the creation of others dates only from the epoch of those phenomena which produced the present geographical conformation. But there is no evidence, nor any plausible ground, to suppose that any species has been added to the Vegetable Kingdom since the creation of man. On the other hand, it is well known that within our historic times certain species of plants have been gradually restricted in their area, and have even finally disappeared, either from natural causes depending on *Geological* changes, or by the direct or indirect agency of man."

M. de Candolle, in thus stating the necessity for *local* Floras, "La Botanique Géographique demande des *Flores Locales*, complètes," further remarks: "J'ai été surpris de ne trouver

* See "Edinburgh Review," No. 212, for October, 1856.

† His words are, "Il y a plusieurs motifs Géologiques et Botaniques pour croire à une apparition successive des Espèces."—Vol. ii., p. iv.

‡ De Candolle observes (p. 1059), "Les Espèces qui composent actuellement le règne Végétal, ou du moins la majorité d' entre elles, paraissent remonter à un temps reculé, antérieur à plusieurs des faits actuels Géographiques et physiques."

aucune trace des *noms Ecossais* dans les Flores d'Ecosse, et des noms *Irlandais* dans les Flores d' Irlande. Ils auraient une grande valeur dans les questions sur l' origine douteuse d' espèces des Iles Britanniques, naturalisées, peut-être, depuis quelques Siècles" (pp. 1349-50); and certainly it is advisable for us to retain, in all our home or district Floras, the local and *common names* of every plant.

Now, it is principally with reference to the *Geology* of our two counties of Northumberland and Durham, as connected with their Botany, that I much desire that more attention may be paid, by some of our members, to the extremely interesting subject of Geographical Botany, and to the distribution of the genera and species in this region; their increase or disappearance; their northern and southern limits; their preference for argillaceous, calcareous, siliceous, porphyritic, volcanic, sienitic, or other mineralogical qualities of the ground. Also the various altitudes to which other plants attain in our mountains and hilly districts are of importance; and the effects of cold and heat, of moisture and dryness, of the density of the atmosphere, and other natural causes, must be at the same time duly considered.

My late friend, Mr. Winch, who for long resided in this town, and, as a Geologist and a Field Botanist, paid early attention to this subject, published, in 1819, a brief interesting "Essay on the Geographical Distribution of Plants," through not only the two before-named counties, but also through Cumberland. And again, in 1825, he somewhat enlarged it in a second edition. Likewise, Mr. Winch wrote a paper, "On the Distribution of the Indigenous Plants of Northumberland and Durham, as *connected* with their *Geology;*" and this instructive, though much too short communication, was afterwards published in the Transactions of our "Natural History Society."

Before I quit this subject, I will record *two* examples, which came under my observation last summer, as relating to the *nature* of the *soils* which some plants naturally prefer. The *one* is, that on the 12th of July last, I found a meadow, about three miles S.W. of Norton, covered with the beautiful *Orchis pyramidalis;* and having previously often seen the plant in the Magne-

sian Limestone district to the north of Hartlepool, I thought it probable that the soil of that field might be somewhat calcareous, and so account for the appearance of a plant which usually grows in chalky localities. I dug up several plants by the roots, and brought with me some soil attached; this, on being submitted to the action of muriatic acid, I saw did not exhibit any trace of lime: the soil, in fact, proved a strong, reddish clay, or purely argillaceous. The *other* example was afforded in another chalk-loving species—namely, *Salvia Verbenaca*, which is so common in the chalk of Cambridgeshire, but, in the county of Durham, I had only noticed it before, in a limestone field and quarry, at Hartlepool. On June 25th last I gathered a plant in a dry, high bank, near Thorp, the soil being gravelly. Some of this soil and gravel I tested with muriatic acid, and observed, by a distinct effervescence, that the latter possessed some proportion of lime.

Here, indeed, the *Salvia Verbenaca*, unlike the pyramidal Orchis, was growing in a situation containing a portion of its favourite calcareous matter.

Again, connected with the increase and dispersion of species, the sides and banks of the numerous railways throughout the kingdom will afford many *habitats* for new plants, and for the increasing of rarer species. This last summer, I myself was fortunate in finding *Astragalus hypoglottis*, remarkably luxuriant in size, *Anthyllis vulneraria*, *Senecio viscosus*, *Sinapis muralis*, *Medicago sativa*, and two or three more plants, on the sides of the railway between Greatham and Norton. Some of these had, most likely, been taken there with ballast from Hartlepool.

When I tell you, from a Parliamentary return, made up to the end of last June, that the length of railways, *opened* in the United Kingdom, came to 8,506 miles, and allowing 12 acres to a mile of railway on the average, you will see the enormous district thus taken up by railways will amount to no less than 102,072 acres. Here, then, a goodly portion of those acres by the railway-sides, being left wild and uncultivated, will allow the natural sowing, growth, and increase of many rare plants.

The following are some of the less common species, which I

have, in addition to those already enumerated, gathered near my own district, in the south of Durham, during the past summer:—*Trollius Europæus*, *Orchis viridis*, *Orchis bifolia*, var. *minor*, *Verbascum Thapsus*, *Cornus sanguinea*, *Gentiana Amarella*, *Pyrethrum Parthenium*, *Solanum nigrum*, *Epipactis palustris*, *Rosa arvensis*, *R. mollis*, *Fumaria capreolata*, *Picris echioides*, *Lactuca virosa*, *Samolus Valerandi*, *Bupleurum rotundifolium*, and *Trifolium arvense*. The last three, viz., *Cardamine amara*, *Thalictrum flavum*, and *Symphytum officinale*, I have never before found among the indigenous plants of that southern district. In Entomology I have, during the same period, discovered nothing very rare; I only took a specimen of *Necrophagus Vespillo*, in June—an insect never common in our locality. This, I conclude, was owing to the last ungenial spring and summer; nor have I seen any very uncommon birds. A friend, however, told me he was at Whitburn in the first week of last July, when he saw a specimen of the Rose-coloured Pastor (*Pastor roseus*), which had then just been shot near that village.

Before I proceed to read to you an account of the meetings, and actual workings of the Club, during the year of my Presidency, I will, in allusion to the recent establishment of the Medical Colleges in this large town, which are in some connexion with the University of Durham, as their fostering *Alma Mater*, state the great desirableness — nay, even necessity — of the Medical Students being obliged, as a part of their course of education, to attend Lectures on Natural History; and no town, in the North of England, can be more fitted for the purpose, seeing that it possesses such a good and well-arranged *Museum*.

Indeed, I rejoice to say, that several important branches of the Natural Sciences are now being brought before the Students in our more ancient Colleges and Universities, who will thus receive opportunities of instruction and examination in them—of which, I trust, many will avail themselves.

Natural History I can safely recommend as, of all human studies, one of the most likely to elevate the mind, to improve the moral nature, and to enlarge the intellectual faculties of young men, especially the powers of observation and perception, and the

careful discernment of even minute distinctions. It has often been said, and I believe with much truth, that "a Naturalist is always an *amiable man;*" and, I hope I may add, a *religious man* too; for, in the pursuit of this study—which has for its objects the wonderful and beautiful creations of nature — man must necessarily raise his thoughts, admiration, and praise, to the power, beneficence, and excellence of that Almighty Being by whom all those things were made. The Naturalist cannot help exclaiming, nearly in the words of the inspired Psalmist — who himself so often refers to the various creatures in nature—"O Lord, our *Creator*, how excellent is thy name in all the Earth! We will think, also, of all Thy works; and our talking shall be of Thy doings." I think I may here mention the recent publication of several works on Natural History, some of which will be of much service to Students. The first that should be named is the beautifully printed work of the late able Naturalist, Dr. Wm. Macgillivray, which, from the peculiar circumstances of the death of the author, the Queen most generously and kindly having purchased, commanded that it should be "printed for private circulation." It is edited by Dr. Lankester, and is entitled "The Natural History of Dee Side and Braemar." The Club is indebted to the consideration of H.R.H. Prince Albert for a copy of this handsome book. And I may further state, that, being illustrated with many wood-cuts, and an admirably executed Geological Map, it describes the mountains and country as well as their Geology; it notices the distribution of the plants, and gives copious Lists of the Fauna and Flora, the *mosses* being *excepted.* It presents a valuable exemplar of our Home Natural History, and I trust it may be taken as a model, in matter, by those who desire to elucidate the natural objects of other districts in the United Kingdom, although they cannot be expected to publish in so very elegant a form.

Another beautiful work, "The Ferns of Great Britain," by Moore, has been completed during the last year. It is illustrated with folio plates of the species, by the method new to this country, termed, in Austria, *Physiotypa*, or "Nature-printing." This newly-invented, or rather *improved* art, is quickly effected, and,

in the case of the *Ferns*, it has answered admirably; for the numerous veins, branchlets, and small stems, are conspicuously brought out, and look like freshly-dried specimens.

The process is well adapted for the less succulent leaves, and for many of the *Musci*, *Fuci*, and *Polypœciæ;* but, for the more delicate flowers and plants, it will not suit; because to these it imparts a stiffness and harshness, which to the eye are very unpleasing. It wants the natural finish, delicacy, and softness, in which its sister art, *Photography*, is so successful. This last process, in the perfect representation of many natural objects, is inimitable; and in those, wherein it has as yet failed, and wherein there now exists some confusion of light and shade, we may expect to see ere long many improvements; and possibly the Light, or Sun, may still be taught, under different chemical preparations, to perpetuate on paper, in addition to the true outlines and exquisite shapes of plants, birds, shells, insects (especially Butterflies), fishes, &c., the very *colours* in which nature has painted them. Also Light-engraving is very excellent in picturing Geological Strata, as exposed in cliffs, rocks, chasms, and mountain ruins, as well as in giving modern buildings and ruins of ancient architecture; and likewise to the Meteorologist, or the Observer of Celestial Phenomena, it is highly serviceable, since the appearance of the passing clouds, and the delicate beauties of the sky in all its varied forms, are represented permanently, by being submitted for a second or two, to the rays of the Great Heavenly Luminary, with a perfection as exquisite as it is faithful.

Part IV. (for 1856) of Vol. 21, of the Linnean Transactions contains a good "description of *Peachia hastata*," a new animal-plant, found at Torquay, in 1854, with a beautiful plate (*tab.* 28); to which are added "Observations on the Family *Actiniadæ*," by Mr. P. H. Gosse. The same part also gives an important "monograph of the *Leucosiadæ*," or ten-footed crabs, illustrated with five plates, by Professor Bell. The "Introduction to *Cryptogamic* Botany," by the Rev. M. J. Berkeley, can scarcely be termed an "Introduction," since it is so learnedly written, and the subject itself so abstruse, that a more simple work should be

the commencement of the student's path among the *Cryptogamia*. A good portion of the work, which treats of *Lichens*, is, however, from the pen of my friend, the Rev. Churchill Babington. The whole is admirably illustrated with excellent wood-cuts, and supplies what has long been desired, towards the better understanding of the more difficult and lower plants.

The translation of Van der Hoeven's "Handbook of Zoology," by Professor Clark, of Cambridge; "Outlines of Comparative Physiology" (second edition), by Louis Agassiz, and A. Gould; and Professor Owen's second edition of his "Classification and Lectures on Zoology;" with the last edition of Cuvier's "Règne Animal," are now indispensable to the Zoologist; because in the present state of that branch of Natural History, Anatomical and Physiological knowledge is exceedingly essential.

The "Philosophical Transactions" for the past year, contain two valuable papers by Dr. Carpenter, entitled "Researches on the *Foraminifera;*" also one by Mr. P. H. Gosse, "On the Manducatory organs in the class *Rotifera*," or Wheel animals. All of these are admirably illustrated with engravings.

In February of the present year, Dr. Williams read to the Royal Society, a communication, "On the reproductive organs of the *Annelids;*" and Mr. Macdonald detailed his "Observations on the natural affinities and classification of the *Gasteropods*." Abstracts of both may be read in the "Proceedings of the Royal Society," Vol. viii., No. 25. And Mr. R. Howse, I am happy to see, is continuing the publication, in the "Annals and Magazine of Natural History," of his "Notes on the *Permian* System of the Counties of Durham and Northumberland."

At last year's meeting of the "German Association for the Advancement of Science," which was held in September, at Vienna, a committee, appointed by the Botanical section, considered the most advantageous plan of conducting *Phœnological* observations; that is to say, of noticing and registering the chief appearances, or *phœnomena*, in vegetation, at different periods of the year, and in accordance with the laws of climate and meteorology. The following plants, among a few others, were fixed upon as the most appropriate for such observations:—

Acer platanoides, *Æsculus hippocastanum*, *Berberis vulgaris*, *Colchicum autumnale*, *Convallaria majalis*, *Corylus Avellana*, *Crocus vernus*, *Cytisus Laburnum*, *Daphne Mezereum*, *Fagus sylvatica*, *Cornus mascula*, *Fraxinus excelsior*, *Fritillaria imperialis*, *Hepatica cærulea*, *Hordeum vulgare*, *H. hibernum*, *H. æstivum*, *Leucojum vernum*, *Lilium candidum*, *Prunus Avium*, *P. Padus*, *Pyrus Malus*, *Ribes Grossularia*, *R. rubrum*, *Sambucus nigra*, *Secale cereale*, *S. hibernum*, *S. æstivum*, *Sorbus aucuparia*, *Syringa vulgaris*, *Triticum hibernum*. And in those species the annexed *phœnomena* are to be annually noticed:—1st, The first appearance of the superior side of the leaves; 2nd, The complete development of the first flower, and the appearance of the pollen; 3rd, The normal ripening of the first fruit (not attacked by an insect); the beginning of the crop of cereals; and 4th, The general decoloration of leaves.

Also, when these periodic appearances are to be noted for many succeeding seasons, the identical trees, or plants, in the same field, or garden, should form the subjects, and the observations be continued under circumstances as much the *same* as possible.*

I may further add, that other *Phœnological* observations, applied with attention, to other branches of Natural History, as Ornithology, Entomology, &c., will prove of much value, and increase our knowledge of climate, and the chief annual epochs of natural objects.

Those members of our Club, who reside much in the country, and who have leisure for such investigations, will find this an occupation affording them very great delight. And for some good "remarks on the importance of registers of periodic *phenomena* in Natural History," I will refer my hearers to the Rev. L. Jenyns's agreeable little work, entitled, "Observations in Natural History."†

As a Field Naturalist, and living in a county celebrated for

* The Report may be seen in the "Literary Gazette," page 22, for January 3, 1857.

† See a long and useful memoir, entitled "Observations des Phénomènes Périodiques," comprising *Botanical* and *Zoological* observations, made in 1854 and 1855, published in Mémoires de L' Acad. Roy. de Belgique," Tom. 30, 1857.

its Field sports, I am certain that two of them—viz., *Shooting* and *Fishing*, may greatly tend to improve a man's knowledge of the natural objects of the country over which he is walking. In following both of these sports, he passes over many little known localities, in which, if he only keep his "eyes well open," he cannot fail to meet with some rare plant, or animal; and, in fishing more especially, as he wanders by the side of a sweet stream, or river, he can often better discover the Geological features, and ascertain the more exact character of the rocks, or banks, on its margin, and notice where the strata become visible within its bed. Nevertheless, in recommending *Fishing* to Field Naturalists, I must restrict that sport to artificial Fly-fishing, or Trolling with a *dead* minnow, or fish, and not to angling with a *live worm;* because from recent dissections of the Common Earth-worm (*Lumbricus terrestris*), Mr. Lockhart Clarke has ascertained that "the central organs of its nervous system consist chiefly of a bilobed cephalic ganglion, and a double chain of subventral ganglia, extending through the whole length of its body." Also that "each ganglion gives off from its sides two pairs of nerves, which, after sending some filaments to the septa and muscular bands, supply the longitudinal, oblique, and circular muscles of the rings."* Indeed, he has shown that the nervous system in this despised animal—which appears little else than a muscular ringed tube—is extremely complex, and abounds in ganglia, nervous centres, and nervous fibres. Although it may be said that these nerves and ganglia are *not* highly sensitive, still they *may*, on being injured or pricked, produce *very acute* pain to the individual. Surely, then, a humane sportsman ought *not* to risk such a *possibility* by running a sharp hook through the entire length of a poor worm, and then immerse it in an element to which it is a stranger.

Two discoveries, connected with the County of Durham, still remain to be stated, and which have been detailed to the scientific world in London.

* See p. 344, and p. 347, "Proceedings of the Royal Society," Vol. 8, No. 24; and also a paper, on the "Développement du *Lombric terrestre*, par M. J. d' Udekem," with three beautiful plates, in "Mémoires publiés par l' Acad. Roy. de Belgique," *Tom*, 27, 1856.

First, Mr. J. W. Kirkby read to the Geological Society, on January 21st last, a notice of the occurrence of a *Malacostracous Crustacean*, and of a new *Chiton* in the Magnesian Limestone of Durham.

And, *second*, Mr. Westwood read to the Linnean Society, on February 3rd last, a description of a new species of *Pulex*, which he named *Imperator*. It was found in a bedstead, at Gateshead.

As to this last discovery, I think, I shall be right, if I express, on behalf of our members who reside here, a unanimous wish that these "Emperor-Fleas" may never be detected in any of the beds, at Newcastle; and that these Mali *Pulices*—never there, "avertant Somnos!"

It now becomes my pleasant duty to present to you the record of the *Field Meetings* of the last year, which I have drawn up from the accurate memoranda sent to me by our able Secretary, Mr. Storey ; and, in doing so, I am extremely sorry to state that I have never yet been able to be present at any one of these scientific and delightful excursions, owing to my numerous avocations and duties. Living, as I do, during a part of the summer months, when these meetings take place, in the extreme southern portion of our united counties, I could never attend any of them, without sacrificing nearly *two entire days*, for which I have really not had sufficient leisure. A great part of the north and west of Northumberland, as well as of the west of Durham, is personally unvisited by me ; and I can, therefore, only express my anxious wish that time may permit me to see its beauties—natural and scientific—at a future season, in company with our friendly and intelligent members.

The First Field Meeting, of the year, was held at *Riding Mill*, on the 6th of June, when these ten members were present—Dr. Embleton ; Messrs Robert Vint, John Thompson, John Storey, W. Green, jun., George Wailes, Edward Mather, George Armstrong, John Walsh, and George Luckley.

The weather, throughout the day, being delightful, the Excursionists, particularly those of the Botanical Section, were enabled to take a long and pleasant ramble from the headquarters at Riding Mill. They noticed nearly 100 species of

plants, chiefly in flower, and they recorded their names. Among the most remarkable may be mentioned *Trollius europæus*, *Paris quadrifolia*, *Crepis paludosa*, and *Neottia Nidus-avis*.

Riding Mill and its environs are so well known to our Members, that I need not here attempt any description of their sweet scenery.

The banks of the Tyne in that vicinity being well wooded, afford very pleasing views. And not far distant, Bywell, a place of antiquity, is discerned.

A Survey of Forfeited Estates, A.D. 1569, describes the town of Bywell as "built in length all of one street, upon the river or water of Tyne, divided into *two* several parishes"—I conclude those now named St. Andrew and St. Peter—"and inhabited by handicraft men, whose trade is in iron-work, for the horsemen and borderers of that country. They are subject to the thieves of Tynedale, and compelled, winter and summer, to bring in all their cattle and sheep into the street in the night season, and watch both ends of the street, and, when the enemy approacheth, to raise hue and cry. In Bywell town, the ancestors of the Earl of Westmoreland built a fair tower, or gate-house, all of stone, and covered with lead—meaning to have proceeded farther, as appears by the walls, the height of a man, left unfinished."

I may remark, if this "fair tower" be the "Old Castle," still remaining (which I suppose it is), it must have been commenced or erected by some of the Nevilles (Earls of Westmoreland), between some year in the reign of King Richard II., A.D. 1377-99, when Bywell Barony passed to them, and the year 1569 or 1570, when it was forfeited.

At the Second Field Meeting, which was held at Staward Peel, on the 2nd of July, Mr. Storey informed me, that, not being with the Club, he was unable to report, from personal observation, what took place; but, from a note by the Rev. J. F. Bigge, of Stamfordham, I am enabled to subjoin the following list of plants, which were collected in that excursion:—*Asplenium Ruta-muraria*, on Langley Castle; *Menyanthes trifoliata*, *Vaccinium Oxycoccos*, *Narthecium ossifragum*, *Athyrium Filix-fœmina*, *Viola palustris*, *Viola tricolor*, on the banks of the Allen, in the

greatest profusion; *Vicia sylvatica*, in great abundance; *Cardamine amara*, *Chrysosplenium alternifolium*, *C. oppositifolium*, *Campanula latifolia*, *Arenaria verna*, *Thlaspi alpestre*, and *Polypodium Dryopteris*.

And of the migratory birds, these two were observed:—*Spotted Flycatcher*, Langley Castle; and *Common Redstart*, near lead-workings, on each side of the Allen, south of the Railway.

Staward Peel, or *Staworth Peel*, as it is printed in Mr. Ingham's Address, is also termed *Staward-le-Peel*.

Some old walls, and a gable of this mediæval fortified house, or castle, are still to be seen. According to Wallis (vol. 2, p. 32), Edward, Duke of York, granted it, in the year 1386, to the Eremite Friars of Hexham, paying the annual rent of five marks for the same. As to the meaning of the word *Peel*, it is almost unnecessary to say, except for my more southern hearers, that it was a *fortified house*,* built, as Mr. Hedley correctly states, "for securing its inhabitants and their cattle in moss-trooping times."

Staward Peel stands among very fine, and even romantic scenery, at a short distance on the west from the "Black Dyke," or, as it is named, the "Scots' Dyke," in Horsley's Map of Northumberland. Dr. Bruce observes, "The only conjecture hazarded respecting the origin of this Dyke is, that it formed the line of demarcation between the Kingdoms of Northumbria and Cumbria."†

The Third Field Meeting took place in Teesdale, on the 21st of July.

This locality is represented, by all who have visited it, as one of extreme interest, in a scientific view, to the Botanist, the Geologist, and the Mineralogist.

I am sorry that I cannot give you a full account of what occurred on that occasion, because I have only been furnished with the names of these plants—some, indeed, of great rarity—

* Or *Castle*, "Pela;" according to Du Cange, "Gloss. ad Scriptores Med. et Inf. Latinitatis," *Tom.* v., p. 339, is the same as "Pelum," "Castellum, arx, Anglis *Pile* vel *Pille*." Both words occur in old Latin charters of the 14th century, as preserved in Rymer's "Fœdera."

† See *Bruce's* "Roman Wall," p. 212.

which were noticed by Mr. John Thompson :—*Primula farinosa*, *Viola lutea*, *Cochlearia officinalis*, *Plantago maritima*, *Rubus saxatilis*, *Potentilla fruticosa*, *Galium uliginosum*, *G. boreale*, *Polygonum viviparum*, *Melampyrum sylvaticum*, *Equisetum variegatum*, *Lycopodium selaginoides*.

No mention is here made of that very lovely plant the Spring Gentian (*Gentiana verna*) which is known, in Teesdale, to the country people, under the name of "Blue Violet" or "*Spring* Violet;" nor is it numbered among the plants discovered in a previous visit by the Club to the same district, at the *same* time, in the year 1853, and given in Sir W. C. Trevelyan's Address for 1854, and published at pp. 329—331, of our "Transactions," Vol. II. Part 4. It seems probable that that species, which flowers in April, being out of blossom, might have been passed over on *July* 21*st*, for it is frequent in Teesdale, both in the uplands and low grounds. It was first discovered there by Messrs Harriman and Oliver, about sixty years ago.

This district of Teesdale is much too extensive to be examined in one or two days; it would require, at the least, as many weeks. The Weeld, or more correctly the *Weel* derived from the Saxon *woel*, a whirlpool, Caldron Snout, the High Force,* or Waterfall, the position of an original and primitive chain bridge, called Winch Bridge (now removed), and other objects, are deserving of attention. Also the remarkable and extensive cliffs, rocks, and beds of Basalt or Trap, in and about the river Tees. Indeed, from hence proceeds the most considerable Basaltic Dyke in this part of the kingdom, because it may be regularly traced for about sixty miles, to Maybecks in Yorkshire. On these subjects it is unnecessary for me to enlarge, since they are detailed in Sir W. C. Trevelyan's address, already referred to.

The Parish of Middleton, Teesdale, is very extensive; but the town on the north side of the Tees—the principal one in the district—is small and chiefly inhabited by miners, many of whom are extremely intelligent. Its little church is ancient, and stands on high ground; it is remarkable for having

* *Force*, meaning a "Waterfall," is probably of Scandinavian or Norse origin: it seems a corruption of the word *foss* in that language.

a distinct *Campanile* or square Bell-tower, on the west, which is distant some yards from the church. The Church and Rectory, formerly the property of the Nevilles, passed, with their other forfeited estates, to the Crown. The Queen is now the Patron, but I understand she allows the Duke of Cleveland to nominate a clergyman. To the west and north extended the ancient forest, bearing the name of Teesdale Forest, opposite to which, on the Yorkshire side of the Tees, was Lune Forest. The former is said to have been abundantly stocked, in the middle of the 15th century; and that, in the severe winter of 1673, no fewer than 400 deer were destroyed by the snow. Teesdale Forest is now disforested, and in lieu of herds of deer, numerous packs of grouse (*Lagopus Britannicus*) a less noble, though perhaps more delicious game, inhabit the treeless moors, fells, and commons. The remains of large oaks are sometimes dug up in the district. And when the numerous plantations, made by the late Duke of Cleveland, shall have grown larger, the aspect of the country will be greatly improved.

The Fourth Field Meeting was held at *Lindisfarne*, on the 26th August.

Mr. Edward Mather thus details an account of the excursion to the senior Secretary, Mr. John Storey, who was unfortunately absent:—

"The parties present, at the Holy Island meeting, were Mr. Ralph Carr, of Hedgely, and his son; Mr. Kell, Rev. Mr. Maughan, of Morpeth; Mr. Coates, of Haydon Bridge; Mr. Crooks, Mr. Pearson, of Sunderland; Mr. Cuthbert Thompson, Mr. George Thompson, of Winlaton; and myself.

"The party proceeded (except Mr. Kell, who went by the first train) by the 7.20 train. On arrival at Belford, they proceeded into the town, in order to procure a conveyance. In consequence of a large funeral in the neighbourhood, a long cart could only be obtained. In this the party proceeded to the Ferry, where Mr. Kell was waiting for them. The day was very fine. The Abbey was the chief point of attraction, and was thoroughly examined, and the Castle afterwards. Mr. Fenton, the Crimean photographer, was busy taking photographs of the Abbey. The

members afterwards dined at the Selby Arms. After dinner, the larger number crossed the sands to Beal, and returned by the 5.45 train. The others remained a short time longer on the island, their intention being to proceed to Bamborough. I know of no discovery being made at all."

Lindisfarne, or Holy Island, has been so often described that I need not add any particular account of it. My predecessors, Archdeacon Thorp and Mr. Sopwith, in their addresses to you, have both mentioned it. And those who desire to peruse a well-written and ample history of "this hallowed land," may consult the Rev. James Raine's "North Durham." They will find also, at page 168, *et seq.* of that work, "Minutes of the Geology of Holy Island," by Mr. John Scafe; and at page 173, lists of the plants are given; and at page 174, a catalogue of the shells is inserted. The Geologist will likewise see, in the "Annals of Philosophy," for December, 1822, more remarks on its Geology, by the late Mr. Winch. Holy Island offers no beauty of scenery; it may be designated as—Isola *Santa*, ma non Isola *Bella*. Its castle, perched on a Basaltic rock, forms the most conspicuous feature.

The Isle lies between two and three miles from the main land; and the shore, at low-water, presents a vast tract of bare sand. A "sun picture," taken by Mr. Roger Fenton, on the day in which this meeting took place, was exhibited in London, at the exhibition of the "Photographic Society" for this year. It is entitled in the catalogue (No. 48), "View on the Beach opposite Holy Island," and the notice of it in the "Literary Gazette," for *January* 10, 1857, calling it "nothing but flat shore, sea and sky," yet describes it as "a remarkable and attractive combination of natural phænomena."

For a very good view of the Monastery of Holy Island, as it was forty years ago, I will refer those gentlemen, who are interested in such ruins, to Raine's "North Durham." It was engraved by J. Lambert, from a drawing made by the eminent antiquary, Mr. E. Blore; and for three Views of it, with an excellent description, as it appeared above eighty years since, Grose's "Antiquities of England," vol. 4, 2nd edition, 1783, may be

consulted. Also, the beautiful frontispiece to vol. 1, of that work, entitled "History Preserving the Monuments of Antiquity," gives a side view of the same venerable edifice.

On this occasion, Mr. Wailes favoured the Club with reading his "Catalogue of the *Lepidopterous Insects* of Northumberland and Durham."

The FIFTH and LAST FIELD MEETING took place at Blyth, on the 1st of October. The following gentlemen, eight in all—Messrs John Storey, Edward Mather, Archibald Dunn, Henry Turner, David Wooster, M. J. F. Sidney, the Rev. H. Hopwood, and the Rev. Mr. Mulcaster, assembled at Cowpen Hall, situate about a mile to the west of Blyth, where they were most hospitably entertained, at breakfast, by M. J. F. Sidney, Esq., one of our active Members.

The river Blyth enters the sea, between North Blyth and South Blyth. The latter has a small port and a quay, for colliers and small vessels. The Bishops of Durham were formerly possessed of the *Jura Regalia;* and the manor passed, by purchase, about two centuries ago, to Col. Thomas Ratcliff, from whom it subsequently came into the possession of Sir M. W. Ridley, Bart.

The senior Secretary, Mr. Storey, read a paper, by Mr. Daniel Oliver, on "Gonidial Swarming in Vaucheria"; also, a notice of the discovery, by Mr. Oliver, of *Scirpus uniglumis*, near Dunstanborough Castle, and of the same species, at Meggy's Burn, near South Blyth.

Mr. Storey found *Thrincia hirta*, near North Blyth, and *Melilotus arvensis*, in the same locality, to which it had, no doubt, been brought in ballast; and he exhibited specimens of *Juncus maritimus*, which he had collected between the High Pans and North Blyth.

On the Magnesian Limestone, near Sunderland, Mr. Albany Hancock has detected several specimens in flower, of *Daphne Mezereum*, thus showing that this very pretty plant is not yet lost to the district.

Mr. Daniel Oliver, Jun., in company with Mr. John Thornhill, has observed *Sambucus laciniata*, near Lumley Castle, and *Rosa arvensis*, near Washington.

Gagea lutea has been found at Hartburn, by the Rev. W. Featherstonhaugh.

Mr. D. Oliver, Jun., has communicated the following interesting note:—

"Towards the close of last year I brought home from Crag Lough, specimens of *Coleochæte pulvinata*, of A. Braun. These were growing upon stones near its margin. I am not aware that the occurrence of this interesting *Alga* has been hitherto recorded in Britain. I took the plant for *Chætophora pisiformis*, and think it not improbable that it may have been from other stations, by previous collectors, referred to the same. Professor A. Henfrey says of it—"It may *possibly* be *Chætophora pisiformis*, but is *certainly* Alex. Braun's *Coleochæte pulvinata*, originally described in 1842, by C. Müller, under the name of *Chætophora tuberculosa* in the 'Flora.'" I am indebted to Professor Henfrey's kindness for the corrected nomenclature. The specimens exhibit numerous *Sporangia*. I found in the same neighbourhood *Palmella nivalis* (Ag.?) growing in a depression of a rock by the edge of the lake."

At Whitburn, a *Patella*, new to the County of Durham, has been met with. Mr. Albany Hancock informs me, that "during the summer, a fisherman brought to the Rev. Geo. C. Abbes, a specimen of *Acmæa testudinalis*, which was obtained on the rocks, in the neighbourhood of Whitburn. Since then, this gentleman has visited the locality, and procured several other individuals. This is the first time that this species has been noticed on the Durham coast; it is stated, however, in Mr. Tate's account of the Farne Islands, that a single specimen has occurred in that district."

The Evening Meetings of the Club have been regularly held in one of the rooms of the Literary and Philosophical Society.

The Eighth took place on Thursday, March 12th, at which the following members were present:—Mr. Goddard (in the Chair), Messrs. J. Mawson, Geo. Luckley, D. Oliver, Jun., John Storey, John Thompson, Richard Howse, Edward Mather and Thomas Pigg.

Mr. Howse read a valuable paper, supplemental to his former

"Catalogue of the Fossils of the *Permian* System of Northumberland and Durham."

It now only remains for me to offer you my best congratulations on the prosperous condition of the Society. And in thanking you kindly for the attentive hearing of my address, I will earnestly hope that every branch of Natural History will continue to be followed up with zeal and personal investigation, by all the Members of the Tyneside Naturalists' Field Club.

The following gentlemen have been elected members of the Club, since the Anniversary, May 15, 1856:—

At the Holy Island Meeting, August 26, 1856—Messrs D. Cunningham, Stockton-on-Tees; James Jackson Scott, Newcastle; Michael Spencer, Lemington Hall; John Thompson, Winlaton.

At the Blyth Meeting, September 24—Rev. Mr. Mulcaster, Bothal; Mr. David Wooster, Wallington.

At the Anniversary Meeting, held this day, April 4, 1857—Revs. George Iliff, Sunderland; A. A. Phillpotts, Boldon; Messrs W. H. Brown, North Shields; William Chartres, William Scheele, Newcastle; William Crozier, C.E., Sunderland; George Hodge, Seaham Harbour; W. H. M. Sidney, Cowpen.

A letter having been read, addressed to Mr. Albany Hancock, by Mr. John Storey, senior secretary to the Club, requesting him to tender, on his behalf, the resignation of his office, owing to continued ill health, and the pressure of other engagements;

It was unanimously resolved, on the motion of Mr. Kell, seconded by Dr. Embleton—

> "That the Club do accept, with regret, the resignation by Mr. John Storey, of the office of Secretary to the Club, which he has, over several years, so much to their advantage, so ably filled; and that the very cordial thanks of the Club be presented to him for his long and valuable services on their account."

VIII.—*A Catalogue of the Lepidoptera of Northumberland and Durham.* By GEORGE WAILES, Member of the Entomological Societies of London, France, and Stettin.

[Read May 19, 1857.]

To prepare a perfect Entomological Fauna of even the most circumscribed district, is, from the very nature and habits of the creatures to be enumerated, impossible, and any approach to completeness as regards the Lepidoptera, most difficult. Whilst in other orders of insects the term of existence in the perfect or imago state, generally extends over periods of several weeks or even months, that of the Lepidoptera is usually confined to a few days, and therefore, unless the collector can avail himself of the short period each particular species is known to be "on the wing," he has little chance of adding it to his list. It is very true that a number of the species (which number is being rapidly augmented through the labours of both British and Continental Entomologists) hybernate, but the greater portion of such species keep themselves so effectually concealed, that the opportunities of noticing them are thereby in reality little increased. The exclusively nocturnal habits of nineteen-twentieths of these insects, contribute still further to the difficulty of ascertaining whether or not they are entitled to rank in a local fauna. Fortunately, however, an earlier state of their existence affords the Lepidopterist the means of detecting many that he never meets with in the perfect state, in which indeed several of the more minute species have not yet been found at large; and in the following Catalogue, I shall have occasionally to include species of which the larvæ alone have been captured within the district.

The immediate vicinity of Newcastle is not at all favourable to the development of these insects—the cold clayey soils, added to the high cultivation of the land, which has almost denuded it of trees, and reduced the hedge rows to the least possible dimensions, offer little encouragement to insects that revel in the luxuriant herbage and sheltered spots of districts more nearly in a state of nature. It is, therefore, to the wooded vallies of the

Derwent, the upper branches of the Tyne and the Wansbeck, and to the romantic denes of the Magnesian Limestone, with their great variety of food plants, that most of the localities enumerated below are to be referred. To such places the collector naturally resorts as the most likely to afford him the objects of his search, especially in cases like my own, where other and more urgent duties restrict the opportunities for collecting. There is no doubt that a more extended search in the wilder portions of both counties would materially increase the numbers of our fauna, and I indulge the hope that I shall be enabled, before my labours close, with the assistance of a few fellow-labourers, who have recently arisen in other parts of the district, and to whose kindness I owe several of the distant habitats given in my list, to include therein many species hitherto undetected within our limits. My own collection, I may remark, was chiefly formed between the years 1826 and 1834; after which I attended little to the subject until 1854, when I resumed it as far as my leisure permitted, in order to enable me to prepare this Catalogue, which I had been induced to undertake, for our Transactions. During the long interval, I find little has been done towards investigating this department of Entomology amongst us. This is much to be regretted, as the earlier portion of the Catalogue will, I fear, be found deficient in several conspicuous species which, I have no reasonable doubt, exist within our boundaries, though, having hitherto escaped notice, they must be consigned to an appendix.

By way of historical introduction, I may premise that the earliest notice of any of these insects in our locality appears in Wallis's well known "Natural History and Antiquities of Northumberland," published in 1769, where he enumerates 9 species of Butterflies and 10 of Moths. It is somewhat singular that for one of the former, "*The Tortoise-shell Butterfly*," he is as yet the only authority for its admission into our fauna. The next local list appeared in the Appendix to Brewster's "Parochial History and Antiquities of Stockton-upon-Tees," published in 1827, and is from the accomplished pen of our late President, John Hogg, Esq. In it, 9 Butterflies and 16 other Lepidoptera

are mentioned as having occurred in the vicinity of that town. The former of these two lists, it is almost unnecessary to observe, dates at a period when descriptive Entomology was in its infancy, but the remarks of the reverend author, some of which I shall quote, show that he was a close and generally accurate observer of nature. Of the latter it is sufficient to state that Entomology formed a very subordinate portion of the labours of the learned author. Passing over the scattered notices of northern habitats communicated by others and myself to Mr. Stephens and Mr. Curtis, and incorporated in their celebrated works on British Entomology, or supplied to other general publications on the science, the next list forms a striking contrast to the former meagre catalogue of our local Lepidoptera—I allude to that contained in Mr. Selby's well known "Fauna of Twizell," as given in the 3rd vol. of the "Annals of Natural History," for the year 1839, wherein he enumerates upwards of 370 species of this order, as being found there, and to which a few subsequent captures are added by him in the Proceedings of the Berwickshire Naturalists' Club. These will all be mentioned in their proper places as I proceed, and I would only remark, that embowered in his fine woods, in a favourable locality, with a true love for nature, and ample leisure to pursue the study, together with the adoption of a mode of capture just then coming into use and peculiarly fitted for such a place as Twizell, it is not surprising that his list is so extensive. The only other local catalogue remaining to be noticed is the "List of some of the Insects found in the County," appended to the Rev. George Ornsby's "Sketches of Durham," published in 1846, and including 144 species of Lepidoptera, which will be duly referred to. Not having had any opportunity of personally examining the specimens from which the two last-mentioned lists have been framed, I cannot vouch for the correctness of the nomenclature, especially amongst the smaller or more obscure species, but as both Wallis and Mr. Hogg have given their authorities, I am enabled, in some measure, to identify the insects they have indicated.

The completion of the Catalogue appears to me to be the

proper time for a few general remarks on the distribution, &c., of the species found within the two counties, and accordingly I shall defer them till that time arrives, noticing, however, any peculiarity of habit, &c., of any particular species as it comes before me.

It only remains to be stated that the arrangement I have adopted is that of my lamented friend, the late J. F. Stephens, Esq., as given in the Catalogue of British Lepidoptera, edited by him for, and published by, the Trustees of the British Museum, not because it is in entire accordance with the views of many of our own Lepidopterists, or those of continental Europe, but as bearing something like the stamp of authority as regards British Lepidoptera, and quite sufficient for my purpose. Possessing an almost complete library on European Entomology, I might have inserted references to a great number of authors and their works; I have, however, confined myself to such as appeared necessary to identify the species, or mark the limits of its variation, giving the preference to those most readily accessible.

Class. INSECTA HAUSTELLATA.

Order. LEPIDOPTERA.

Sect. 1. RHOPALOCERA, *Bois.*

Family 1. PAPILIONIDÆ, *Leach.*

Sub-family 2. RHODOCERIDI, *Steph.*

1. Gonepteryx, *Leach.*

1. G. Rhamni, *Linn.*

Papilio Rhamni, *Linn. S. Nat.* ii. 765.—*Don. Brit. Ins.* vi. *pl.* 145.—*Hüb. Pap. f.* 442-444.—*Wood Ind. Ent. t.* 1, *f.* 2. Gonepteryx Rhamni, *Steph. Illust. Haust.* i. 8. —*Stainton, Manual* i. 16.

Larva. *Hüb. Gesch. Pap.* II. *Gen. C. e.* 1.—*Dup. Icon.* i. *pl.* 4, *f.* 15.—*Don. Brit. Ins., ut sup.*

Once near Darlington.—*J. C. Backhouse, Esq.*

Probably its extreme northern locality, as the food plants of the larva, *Rhamnus catharticus* and *R. Frangula*, although not

rare in Yorkshire, barely reach the southern part of Durham. The insect is far from scarce in the former county.

2. Colias, *Fab.*

1. C. Edusa, *Fab.*

Papilio Edusa, *Fab. M.* ii. 23.—*Don. Brit. Ins.* ii. 17, *pl.* 43, *fig. sup.*—vii. 60, *pl.* 238, *f.* 2.—*Hüb. Pap.* 429-431.—*Wood Ind. Ent. t.* 1, *f.* 5. Colias Edusa, *Steph. Illust. Haust.* i. 12.—*Staint. Man.* i. 16.

Larva. *Hüb. Gesch. Pap.* II. *Gen. C. d.* 1.—*Dup. Icon.* i. *pl.* 4, *f.* 14.

Scarce, and only appearing at uncertain intervals in the autumn. I possess a specimen taken by the late C. C. Abbs, Esq., near Fulwell, in that "annus mirabilis" for Entomologists, 1826. "At the mouth of Castle Eden Dene."—*Mr. T. J. Bungey.*—*Ornsby's Durham.* Darlington, Sunderland, Shull, near Wolsingham.—*W. Backhouse, Esq.* Ryhope, once.—*E. Backhouse, Jun., Esq.*

Sub-family 3. PIERIDI, *Steph.*

3. Pieris, *Schrank.*

1. P. Brassicæ, *Linn.*

Papilio Brassicæ, *Linn. S. Nat.* ii. 759.—*Don. Brit. Ins.* xiii. 29, *pl.* 446.—*Hüb. Pap.* 401-403.—*Wood Ind. Ent. t.* 1, *f.* 7. Pontia Brassicæ, *Steph. Illust. Haust.* i. 15. Pieris Brassicæ, *Staint. Man.* i. 18.

Var. *a.* Pontia Chariclea, *Steph. Illust. Haust.* i. 17, *t.* 3, *f.* 1, 2.—*Wood Ind. Ent. t.* 1, *f.* 8.

Larva. *Hüb. Gesch. Pap.* II. *Gen. C. a. b.* 2.—*Dup. Icon.* i. *pl.* 3, *f.* 7.—*Don. Brit. Ins. ut sup.*

This species, "the large white Butterfly" of our gardens, is common everywhere, the first brood appearing towards the end of May, and the second in July and August. The larvæ are the pests of our gardens, and often occur in such profusion as entirely to devour the leaves of the cabbage tribe infested by them, leaving nothing but the midribs unconsumed. They are very subject to the attack of a small ichneumon, *Microgaster*

glomeratus, *Linn.*, which destroys great numbers. The small yellow coccoons of its pupæ may frequently be observed clustered round the shrivelled body of the caterpillar, which has crawled up a wall apparently in its last efforts to assume the pupa state itself.

It seems to be agreed by all Entomologists, that the *Pontia Chariclea*, *Steph.*, is only a variety of this species. I have taken it near Newcastle in the very beginning of May, and it is included in the list given in "Ornsby's Durham."

2. P. Rapæ, *Linn.*

Papilio Rapæ, *Linn. S. Nat.* ii. 759.—*Hüb. Pap.* 404, 405.—*Wood Ind. Ent. t.* 1, *f.* 9. Pontia Rapæ, *Steph. Illust. Haust.* i. 16. Pieris Rapæ, *Staint. Man.* i. 18.

Var. *a.* Pontia metra, *Steph. Illust. Haust.* i. 19.—*Wood Ind. Ent. t.* 1, *f.* 10.

Larva. *Hüb. Gesch. Pap.* II. *Gen. C. b.* 1.—*Dup. Icon.* i. *pl.* 3, *f.* 8.

More abundant than the last, frequenting gardens and cultivated ground, appearing early in May, and again in July. The eggs are apparently deposited in a scattered manner, and the larvæ more generally diffused than those of *P. Brassicæ*, so that they seldom leave such marked traces of their ravages. I have often observed them abundant on the mignonette in autumn. *P. Metra*, *Steph.*, is now considered a variety of this species. I meet with a few specimens annually in my own garden, usually in April. This year I captured one on the 6th of that month, which had just emerged from the pupa. I have repeatedly noticed that all the specimens which are produced from pupæ that have passed the winter in my stoves or greenhouses—a locality to which the larvæ frequently resort in autumn to undergo their change—prove to be this variety.

3. P. Napi, *Linn.*

Papilio Napi, *Linn. S. Nat.* ii. 760.—*Don. Brit. Ins.* viii. 23, *pl.* 280, *f.* 1.—*Hüb. Pap.* 406, 407, 664, 665.—

Wood Ind. Ent. t. 1, *f.* 11. Pontia Napi, *Steph. Illust. Haust.* i. 20. Pieris Napi, *Staint. Man.* i. 19.

Var. *a.* Pontia Sabellicæ, *Steph. Illust. Haust.* i. 22, *t.* 3, *f.* 3, 4.—*Wood Ind. Ent. t.* 1, *f.* 12.

Larva. *Hüb. Gesch. Pap.* II. *Gen. C. b.* 2.—*Dup. Icon.* i. *pl.* 3, *f.* 9.

Very common, especially in damp fields, lanes, and marshy places. The first brood appears in May and June, and the second in August. It varies much in the colour of the wings, and in the intensity and clearness of the markings. The *P. Sabellicæ* of Stephens differs greatly in the shape of the wings, though it seems agreed that it is only a variety of the species. The rearing of both forms from one batch of eggs can alone satisfactorily settle the point. This variety is not very uncommon in these counties, and is very perceptible when on the wing. I have also been accustomed to take a very fine variety in a field, near Hartley, which, besides varying a little in shape, is somewhat larger, and has both the ground colour and the various markings of the wings on both sides more intense and sharper defined than in the type.

4. Anthocaris, *Bois.*

1. A. Cardamines, *Linn.*

Papilio Cardamines, *Linn. S. Nat.* ii. 761.—*Don. Brit. Ins.* v. 83, *pl.* 169.—*Hüb. Pap.* 419, 420, 424, 425, 791, 792.—*Wood Ind. Ent. t.* 1, *f.* 14. Pontia Cardamines, *Steph. Illust. Haust.* i. 23. Anthocaris Cardamines, *Staint. Man.* i. 20.

Larva. *Hüb. Gesch. Pap.* II. *Gen. C. c.* 2.—*Dup. Icon. pl.* 3, *f.* 10.—*Don. Brit. Ins., ut sup.*

This beautiful Butterfly is generally distributed over the two counties, frequenting damp places in fields, lanes, and woods, during May and June, where the principal food plant of the larva, *Cardamine pratensis*, of which it devours the seed vessels, occurs. Noticed by Wallis, i. p. 353, as "the *orange-yellow and white Butterfly*," who adds, "It is one of our first *Butterfly* visitants in the spring, making its appearance in May." This

year (1857) on the 4th June, in the vicinity of Callaly, I observed its simultaneous occurrence in great numbers throughout that district, where not a single one was to be seen the previous day—a striking, but not unfrequent incident amongst the Diurnal Lepidoptera.

The usual expansion of the wings is 1′ 8″ to 1′ 11″, but in the year 1832, none exceeded 1′ 3″; and so marked was the difference all over the country, that many were inclined to consider the specimens as those of a distinct species. The following season there was no departure from the normal size.

Family 2. NYMPHALIDÆ, *Swain.*

Sub-family 1. SATYRIDI, *Steph.*

5. Lasiommata, *West.*

1. L. Ægeria, *Linn.*

Papilio Ægeria, *Linn. S. Nat.* ii. 771.—*Don. Brit. Ins.* xiv. 77, *pl.* 493.—*Hüb. Pap.* 181, 182.—*Wood Ind. Ent. t.* 1, 36. Hipparchia Ægeria, *Steph. Illust. Haust.* i. 54. Lasiommata Ægeria, *Staint. Man.* i. 27.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. F.* 6, 1.—*Dup. Icon.* i. *pl.* 27, *f.* 77.

Apparently local, occurring in April and May, and again in July and August, in and near woods. The late Mr. R. Currie took it in the neighbourhood of Belford, in the spring of 1826. "Twizell."—*P. J. Selby, Esq.* "Castle Eden Dene."—*William Backhouse, Esq.* Sunderland.—*E. Backhouse, Jun., Esq.*

2. L. Megæra, *Linn.*

Papilio Megæra, *Linn. S. Nat.* ii. 771.—*Don. Brit. Ins.* viii. 71, *pl.* 209.—*Hüb. Pap.* 177, 178, 914-917.—*Wood Ind. Ent. t.* 2, 37. Hipparchia Megæra, *Steph. Illust. Haust.* i. 55. Lasiommata Megæra, *Staint. Man.* i. 27.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. F.* 1.—*Dup. Icon.* i. *pl.* 26, *f.* 72.

Generally distributed in dry lanes and about walls, appearing in May, and a second time in August and September. It is the

"*gold-yellow and brown Butterfly*" of Wallis, i. 354, who truly observes, "It delights to rest on dry banks, stones, and rocks." Mr. Selby informs me that it has of late years become much less common about Twizell than formerly.

8. Hipparchia, *Fab.*

1. H. Semele, *Linn.*

Papilio Semele, *Linn. S. Nat.* ii. 772.—*Don. Brit. Ins.* viii. 17, *pl.* 259.—*Hüb. Pap.* 143, 144, 826, 827.—*Wood Ind. Ent. t.* 2, 38. Hipparchia Semele, *Steph. Illust. Haust.* i. 56.—*Staint. Man.* i. 28.

Larva. *Dup. Icon.* i. *pl.* 28, *f.* 78.

Rocky places and gravelly banks, where it is to be met with in some abundance in July and August. With us it is almost confined to the Magnesian Limestone district—Marsden, Castle Eden, old ballast hills, at Jarrow, where it swarms, or, at least, did so some years ago. "At the mouth of Castle Eden Dene, and near Cassop."—*Ornsby's Durham.* "Sea coast near Bamburgh."—*P. J. Selby, Esq., in Fauna of Twizell.* Castle Eden and Hartlepool.—*W. Backhouse, Esq.*

Duponchel, in his *Iconographie*, i. 190, remarks respecting its larva, "Ses mœurs sont les mêmes que celles de la chenille du Satyre *Circé*, c'est-à-dire qu'elle ne se suspend pas pour se chrysalider, mais qu'elle se pratique une petite cavité dans la terre, où elle subit sa métamorphose, a l'instar des chenilles de Noctuelles;" a statement which my friend R. F. Logan, Esq., of Duddingston, so well known for his patient investigation of the metamorphoses of the Lepidoptera, informs me he has verified.

2. H. Janira, *Linn.*

Papilio Janira, *Linn. S. Nat.* ii. 475.—*Wood Ind. Ent. t.* 2, *f.* 41. P. Jurtina, *Linn. S. Nat.* ii. 475, *fœm.*—*Don. Brit. Ins.* ix. 69, *pl.* 320.—*Hüb. Pap.* 161, 162, 593-596. Hipparchia Janira, *Steph. Illust. Haust.* i. 59.—*Staint. Man.* i. 28.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. F. a.* 2.—*Dup. Icon.* i. *pl.* 27, *f.* 76.

Abundant everywhere in grassy places, from the end of June to the beginning of September. In the Twizell, Durham, and Stockton lists.

3. H. Tithonus, *Linn.*

Papilio Tithonus, *Linn. Mant.* i. 537.—*Wood Ind. Ent. t.* 2, *f.* 40. P. Pilosellæ, *Don. Brit. Ins.* xii. 33, *pl.* 405. P. Herse, *Hüb. Pap.* 156, 157, 612. Hipparchia Tithonus, *Steph. Illust. Haust.* i. 58.—*Staint. Man.* i. 28.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. F. a.* 1.—*Dup. Icon.* i. *pl.* 27, *f.* 74.

Local, but generally abundant where found; making its appearance in July. In profusion in a single field near Whitley, where the road to Hartley crosses Briardean Burn—Meldon Park—by the roadside about half way between Morpeth and Longhirst. Castle Eden Dene—Seaton Carew.—*Wm. Backhouse, Esq.* "Castle Eden and other Denes."—*Ornsby's Durham.*

9. Enodia, *Hüb.*

1. E. Hyperanthus, *Linn.*

Papilio Hyperanthus, *Linn. S. Nat.* ii. 768.—*Don. Brit. Ins.* viii. 53, *pl.* 271.—*Wood Ind. Ent. t.* 2, *f.* 45. P. Polymeda, *Hüb. Pap.* 172, 173. Hipparchia Hyperanthus, *Steph. Illust. Haust.* i. 60.—*Staint. Man.* i. 28.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. F. a. b.* 2.—*Dup. Icon.* i. *pl.* 27, *f.* 75.

Very abundant in damp grassy lanes and woods. It appears in June and July, and varies much in the number and magnitude of the ocelli, which not rarely differ on the opposite wings of the same specimen, and are sometimes entirely obliterated and replaced by mere white spots.

10. Erebia, *Dalm.*

1. E. Blandina, *Fab.*

Papilio Blandina, *Fab. M.* ii. 41.—*Don. Brit. Ins.* xii. 87, *pl.* 426.—*Wood Ind. Ent. t.* 2, *f.* 43, *t.* 3. *f.* 7. P. Medea, *Hüb. Pap.* 220-222. Hipparchia Blandina, *Steph. Illust. Haust.* i. 62. Erebia Blandina, *Staint. Man.* i. 29.

This, the most interesting of our local Butterflies, was first met with in England by the late William Backhouse, Esq., in Castle Eden Dene, about thirty-five years ago, and it is only known at present to frequent a very few localities in some of the Yorkshire and Lancashire dales. In Scotland it is more generally diffused. In 1829 I first had the pleasure of capturing it in the above locality, where it abounds, in the early part of August, in the more open grassy places in the dene. The number and distinctness of the ocelli vary a good deal, especially in the males. With regard to its variations, I have observed elsewhere,* "that the males never have the broad brown band underneath the posterior wings, instead of the blueish-ash one, whilst the females may be considered as divided into two great varieties (equally common), distinguishable not only by the colour of that fascia, but by the greater distinctness of the ocelli, which, in the variety η of Stephens (that with the blueish-ash fascia, which I conceive should have been the typical one), are rather obscure, and approach, in appearance, those of the males." This year, 1857, I captured a female, having the rufous on the fascia of the upperside of the anterior wings, in which are the ocelli, replaced by very pale luteous, almost white. It was reported, some twenty years ago, that its congener, *E. Cassiope*, had been taken in the dene, but this is very unlikely, as that species only occurs on mountain sides at from 1500 to 2000 feet of elevation in our latitude (55 degrees), and at quite a different season of the year. Such a report might originate in the capture of some very small specimen, for I once met with one, a male, not larger than the usual size of *Cassiope*.

The larva has never been figured, and but seldom seen. This year, for the first time, I have succeeded in obtaining a few eggs, which hatched about fourteen days after they were deposited, and the larvæ are now (October) feeding freely on several species of *Poa*. They have undergone their second moult, and may be described as pale green, with a dark green or brownish stripe down the back, and two white ones, narrowly bordered by the same dark colour, on each side. In the lower white stripe on

* Ent. Mag. vol. i., p. 41, 1832.

each side are the spiracles. The posterior extremity is attenuated and slightly furcate, as in the other larvæ of the family.*

11. Cænonympha, *Hüb.*

1. C. Davus, *Fab.*

Papilio Davus, *Fab. G.* 259.—*Wood Ind. Ent. t.* 2, *f.* 47. Hipparchia Davus, *Steph. Illust. Haust.* i. 67, *pl.* 7. Papilio Hero, *Don. Brit. Ins.* vi. 17, *pl.* 186. P. Tullia, *Hüb. Pap.* 243, 244. Cænonympha Davus, *Staint. Man.* i. 32.

Var. *a.* Papilio Polydama, *Haw. L. B.* 16. Hip. Polydama, *Steph. Illust. Haust.* i. 67, *pl.* 7, *f.* 3.—*Wood. Ind. Ent. t.* 2, *f.* 46.

Var. *b.* Papilio Typhon, *Haw. L. B.* 16. Hip. Iphis, *Steph. Illust. Haust.* i. 64.

This is a most variable insect, and has, it will be observed, been considered as constituting three distinct species, to which a fourth has been added by Zetterstedt in his "Insecta Lapponica," p. 905, under the name of *Isis*. Certainly none of our British Butterflies vary so much from mere geographical distribution. The specimens taken near Manchester, its most southern limit with us, are dark, and have the ocelli large and beautifully developed, constituting the type. Those of our counties are much paler, and vary greatly amongst themselves. They are to be referred to the varieties *a.* and *b.*, especially the former. I possess specimens from Kinloch Rannoch, in Perthshire, having still paler wings, with barely a trace of any ocellus; and my friend,

* Having this summer captured *E. Cassiope* on the mountains near Sprinkling Tarn, Cumberland, and obtained a few larvæ from eggs deposited by one of the specimens—which, however, I regret to say, have since all died, both those in my own possession, and those given to my friends—I may as well place on record a description of them, as the larva was previously entirely unknown: Pale green, with numerous darker green longitudinal lines shading into the ground colour, and with a well defined white line along each side in the region of the spiracles. The larvæ fed upon *Poa annua* and *Festuca ovina*, though I suspect, in a state of nature, they live on the young leaves of *Nardus stricta* or some of the smaller *Junci*, which constitute the principal herbage of the mountain sides where the insect is met with. I hope, ere this Catalogue is completed, to add this species to our local fauna from the green hills of the Cheviot range, as no doubt it is generally distributed at the proper elevation, having already, in accordance with my suggestions, been found in unexpected parts of Cumberland, and being pretty widely spread throughout Scotland.

Henry Doubleday, Esq., of Epping, informs me that he has a pair from Orkney equally devoid of markings, with the ground colour almost white.

The perfect insect frequents our wet, mossy bogs in July, and I have taken it also late in June, and early in August. Needless Hall Moor—Moors about Cambo—Prestwick Car—Muckle Moss, near Haydon Bridge—Moss near Crag Lough. Moors near Shull.—*Wm. Backhouse, Esq.* "High marshy ground, near Hoppyland.—*Rev. E. Blenkinsopp.*"—*Ornsby's Durham.*

2. C. Pamphilus, *Linn.*

Papilio Pamphilus, *Linn. S. Nat.* ii. 791.—*Wood Ind. Ent. t.* 2, *f.* 49. P. Nephele, *Hüb. Pap.* 237-239. Hipparchia Pamphilus, *Steph. Illust. Haust.* i. 69. C. Pamphilus, *Staint. Man.* i. 32.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. F. c.* 1.—*Dup. Icon.* i. *pl.* 30, *f.* 86.

Abundant on grassy heaths and commons in all parts of the two counties. June and September may be considered its principal times of appearance, but it is often to be met with during all the intervening months. Included in both the Twizell and Durham lists.

Sub-Family 3. VANESSIDI, *Steph.*

12. Cynthia, *Fab.*

1. C. Cardui, *Linn.*

Papilio Cardui, *Linn. S. Nat.* ii. 774.—*Don. Brit. Ins.* ix. 9, *pl.* 292.—*Hüb. Pap.* 73, 74.—*Wood Ind. Ent. t.* 1, *f.* 33. Cynthia Cardui, *Steph. Illust. Haust.* i. 47.—*Staint. Man.* i. 37.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. C. a.* 1.—*Dup. Icon.* i. *pl.* 12, *f.* 42.

This fine species is very uncertain in its appearance. In the autumn of 1826 it swarmed along our coast. Since that period I have never seen it in any abundance, though hardly a year passes without my observing single specimens about Tyne-

mouth and Cullercoats at that season. Rare, near Stockton.—*J. Hogg, Esq.* Darlington and Seaton Carew.—*Wm. Backhouse, Esq.* Sunderland, occasionally abundant.—*E. Backhouse, Jun., Esq.* "Near Horden.—*W. J. T. Bungey.*—Pelaw Leazes, and near Whitesmocks."—*Ornsby's Durham.* "Twizell."—*P. J. Selby, Esq.*

13. Vanessa, *Fab.*

1. V. Atalanta, *Linn.*

Papilio Atalanta, *Linn. S. Nat.* ii. 779.—*Don. Brit. Ins.* viii. 19, *pl.* 260.—*Hüb. Pap.* 79, 80.—*Wood Ind. Ent. t.* 1, *f.* 31. Vanessa Atalanta, *Steph. Illust. Haust.* i. 46.—*Staint. Man.* i. 38.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. C. a.* 2.—*Dup. Icon. pl.* 12, *f.* 41.

This beautiful Butterfly appears about the middle of August, and continues on the wing till October, when it retires to its winter quarters, and re-appears in spring. In some years it abounds, as in the present (1857), and attracts general attention by the brilliant red fascia (hence its name of "Red Admiral") and pure white spots on the intensely black upper surface of the wings. The under surface of the posterior wings has been well described as "defying the efforts of the finest pencil." It is a bold, fearless insect, and, with a little caution, may be approached and closely examined, especially when sipping the honey from the flowers of the Ragwort, and spreading its gay wings to the autumnal sun. It will even permit the observer to touch it without being alarmed. It is generally diffused over the two counties, and is mentioned in the Stockton and Twizell Faunas, and in "Ornsby's Durham." Wallis gives it as "*the large stately Butterfly*, called *The Admiral.*"

Stephens says, *l. c.*, "the Caterpillar feeds on the *Urtica urens* and *U. dioica*, preferring the seeds;" and Hübner figures it as feeding on the seeds of the latter plant; but I have never detected it, and am satisfied that this information is erroneous, and that Duponchel is correct when he says (p. 105), "Cette Chenille vit solitairement sur toutes les espèces *d'orties*, principale-

ment sur celles qui croissent le long des murs ou des haies; mais c'est inutilement qu'on l'y chercherait si l'on ne savait sa manière de vivre: au lieu de se tenir en évidence sur la plante comme celles du *Paon de jour* et de la *Petite Tortue*, elle choisit une ou deux feuilles qu'elle replie sur elles-mêmes, et dont elle réunit les bords par des fils, afin de s'en former une cellule où elle ne soit pas vue de ses ennemis. Cependant, comme c'est aux dépens de cette cellule dont elle ronge les feuilles qu'elle se nourrit, elle est obligée de s'en fabriquer une nouvelle chaque fois qu'elle se trouve à découvert dans la première. C'est ainsi qu'elle passe sa vie en recluse depuis sa sortie de l'œuf jusqu'à sa transformation." On mentioning this to that close observer of nature, our fellow member, Mr. J. Hancock, he informs me he has met with the larvæ living, as thus described by Duponchel.

2. V. Io, *Linn.*

Papilio Io, *Linn. S. Nat.* ii. 769.—*Don. Brit. Ins.* vi. 67, *pl.* 206.—*Hüb. Pap.* 77, 78.—*Wood Ind. Ent. t.* 1, *f.* 30. Vanessa Io, *Steph. Illust. Haust.* i. 44.—*Staint. Man.* i. 38.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. C. a.* 1.—*Dup. Icon.* i. *pl.* 10, *f.* 36.—*Don. Brit. Ins. ut sup.*

Generally distributed over the two counties, but never very abundant. Appears early in autumn, and after hybernation in the spring.

The larvæ, like those of *V. Urticæ*, feed gregariously on nettles; and, consequently, are more frequently noticed than those of the last species. The beautiful "eye" on each of the wings attracts the attention of every one. It is "*The Peacock's-eye Butterfly*" of Wallis, i. 357, who was aware of its hybernation, observing that "it is often seen in fields and gardens in the warm summer months, and in cold ones in close retreats." It is included in the Norton, Twizell, and Durham lists.

3. V. Antiopa, *Linn.*

Papilio Antiopa, *Linn. S. Nat.* ii. 776.—*Don. Brit. Ins.* iii.

45, *pl.* 89.—*Hüb. Pap.* 79, 80.—*Wood Ind. Ent. t.* 1, *f.* 31. Vanessa Antiope, *Curtis B. E.* ii. *t.* 96. V. Antiopa, *Steph. Illust. Haust.* i. 45.—*Staint. Man.* i. 38.

LARVA. *Hüb. Gesch. Pap.* I. *Nymph. C. a.* 2.—*Dup. Icon.* i. *pl.* 10, *f.* 35.—*Don. Brit. Ins. ut sup.*—*Curtis B. E. ut sup.*

One of the rarest and most striking of our British Butterflies, known to the old London Aurelians as the "*Camberwell Beauty*," from the locality in which it used to occur. Like *Cynthia Cardui* it would seem to appear occasionally, in great numbers, in particular localities. Our fellow member, William Backhouse, Esq., informed me many years ago that, about the year 1820, he saw vast numbers of it strewing the sea-shore at Seaton Carew, both in a dead and living state; and his cabinet contains a specimen he then procured. Now, it is surely more reasonable to suppose that these specimens had been blown from the land, than that they had crossed a sea at least 300 miles wide; and the one above alluded to, which Mr. B. has kindly shown me, confirms me in that opinion, as it has the pale whitish margin to the upper side of the wings, so characteristic of our British specimens, which is replaced by yellow in nearly all the Continental and American specimens. The insect is very abundant throughout Europe, and such as have hybernated, alone seem to acquire the pale border which our summer specimens possess. About twenty years ago, I inquired of a very intelligent friend, who had passed his early life at Stockton, whether he had any recollection of having seen such a butterfly in that vicinity, and his reply was that he knew it well, and that it went by the name of "*The White Petticoats!*" No one who knows the insect can question the appropriateness of the name, or its application to this species. Stephens, *l. c.*, says, "Mr. Backhouse informs me that it has been found repeatedly near Seaton, Durham, and often floating on the River Tees."

It would seem, therefore, that the south-eastern corner of Durham has been rich in this fine insect; and Mr. Hogg kindly sends me his notes of two specimens from the same locality:*—

* Also communicated by him at the time, to the London Entomological Society, and printed in its Transactions, vol. iv., p. 82; and in the Annals of Nat. Hist., vol. xii., p. 363.

"August 7th, 1831, saw a single but perfect specimen of the *Camberwell Beauty*. Just as I was going to take it up, it escaped. It flew strong and high, and was lost in a plantation at Norton." "September 2nd, 1842, I caught a fine specimen of the *Camberwell Beauty* (*Vanessa Antiopa*), whilst it was busily sucking an apricot against a south wall in my garden at Norton." Once near Gibside.—*Mr. J. Hancock.* One seen near Twizell some years ago.—*P. J. Selby, Esq.* A specimen at Longhirst about the middle of August, 1857.—*Ent. W. Intelligencer*, ii. 182.

4. V. Polychloros, *Linn.*

Papilio Polychloros, *Linn. S. Nat.* ii. 777.—*Don. Brit. Ins.* viii. 69, *pl.* 278.—*Wood Ind. Ent. t.* 1, *f.* 26.—*Hüb. Pap.* 81, 82. V. Polychloros, *Steph. Illust. Haust.* i. 42.—*Staint. Man.* i. 39.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. C. c.* i.—*Dup. Icon.* i. *pl.* 2, *f.* 39.

The claim of this species to be admitted into our local fauna rests at present, as mentioned in my introductory remarks, solely on the authority of Wallis; but there is no doubt that he was fully aware of its distinctness from the next species, which he also mentions, and with which alone it could be confounded. I give the whole of what he says: "The *Tortoise-shell Butterfly* is not unfrequent in Alpine woods and shady pastures, in July and August. I have also observed it in gardens." In the note of authorities which he appends to each insect—for it must be borne in mind that specific names were then unknown—any question about its identity is entirely set at rest by the following: "Papilio Urticarum referens major alis amplioribus, quam Ulmariam vocitare soliti sumus" (*Raj. Ins.* p. 118, n. 2).—"Papilio testudinarius major" (*Petiv. Mus.* p. 34, n. 315).—"Papilio tetrapus; alis angulatis fulvis nigro maculatis primariis punctis quatuor nigris" (*Linn. Faun. Suec.* p. 232, n. 773; *List. Goed.* 5, f. 3; *Albin. Ins.* 56).

It is certainly strange that this conspicuous species should not have been met with by any other person than the reverend

author, but we must recollect that few of the subsequent observers have had the same leisure for continued investigation that fell to his lot, and that the beautiful vale of North Tyne, where his principal labours lay, is as yet a *terra incognita*, so far as Entomology is concerned. There is certainly every probability that future researches will enable us to corroborate his record of the species, though the paucity of the English Elm, upon which the larva feeds, in many parts of the two counties, certainly does not add to the chances of success.

5. V. Urticæ, *Linn.*

Papilio Urticæ, *Linn. S. Nat.* ii. 777.—*Hüb. Pap.* 87-89.—*Don. Brit. Ins.* ii. 49, *pl.* 55.—*Wood Ind. Ent. t.* 1, *f.* 27.

V. Urticæ, *Steph. Illust. Haust.* i. 43.—*Staint. Man.* i. 39.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. C. c. d.*—*Dup. Icon.* i. *pl.* 10, *f.* 37.—*Don. Brit. Ins. ut sup.*

Abundant. The females are the earliest of our Butterflies seen on the wing, issuing from their hybernacula on the first sunny days of spring, and again disappearing should cold weather occur. They survive till the early part of June. The first brood of the year, the produce of their eggs, assumes the perfect state at the end of that month, and a second one in September, of which the females hybernate. Wallis quaintly observes: "It frequently outlives the winter by concealing itself in private recesses, where neither winds nor rains can hurt it." I have noticed these hybernated specimens in great abundance, and, in very early spring, about Dilston, where the crevices of the old ruins and walls no doubt afford them comfortable winter quarters, and such warm and sheltered spots tempt them early from their hiding places. The larvæ, like those of *V. Io*, are gregarious on Nettles. It is included in the Norton and Twizell lists, and also in "Ornsby's Durham."

14. Grapta, *Kirby.*

1. G. C-album, *Linn.*

Papilio C-album, *Linn. S. Nat.* ii. 778.—*Hüb. Pap.* 92, 93.—*Don. Brit. Ins.* vi. 45, *pl.* 199.—*Wood Ind. Ent. t.* 1,

f. 27. Vanessa C-album, *Steph. Illust. Haust.* i. 42. Grapta C-album, *Staint. Man.* i. 40.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. C. d.*—*Dup. Icon.* i. *pl.* 11, *f.* 39.—*Don. Brit. Ins. ut sup.*

Probably more generally diffused over the two counties than we are aware of, and overlooked when on the wing, as being merely the last species, with which it is contemporaneous in its appearance and similar in its habits. Wallis is the earliest to note it as a Northumbrian species. He says, "*The Tortoise-shell Butterfly, with laciniated wings*, is not unfrequent in vale-meadows and gardens in August." Castle Eden and Shull.—*Wm. Backhouse, Esq.* Castle Eden and Darlington.—*Mr. Sang.* Gibside.—*Mr. J. Hancock.* "Castle Eden Dene, and occasionally in Pelaw Wood, May and September."—*Ornsby's Durham.*

Sub-family 4. ARGYNNIDI, *Steph.*

15. Argynnis, *Fab.*

1. A. Paphia, *Linn.*

Papilio Paphia, *Linn. S. Nat.* ii. 785.—*Hüb. Pap.* 69, 70, 767, 768, 935, 936.—*Don. Brit. Ins.* vii. 83, *pl.* 247.—*Wood Ind. Ent. t.* 1, *f.* 26. A. Paphia, *Steph. Illust. Haust.* i. 40.—*Staint. Man.* i. 41.

Larva. *Hüb. Gesch. Pap.* I. *Nymph. B. f.* 2.—*Dup. Icon.* i. *pl.* 14, *f.* 45.

The early part of July is the time of the appearance of this fine species, which has occurred in various parts of the counties—Gibside, Castle Eden Dene, Dilston. Castle Eden Dene.—*Wm. Backhouse, Esq.* Gibside.—*Mr. J. Hancock.* "Castle Eden Dene, beginning of July."—*Ornsby's Durham.*

It is a powerful insect on the wing, and I have observed it early in September, at an altitude of 1,500 feet, amongst the Grampians, in rapid flight to even higher ground.

2. A. Aglaia, *Linn.*

Papilio Aglaia, *Linn, S. Nat.* ii. 785.—*Hüb. Pap.* 65, 66.—*Don. Brit. Ins.* ix. 31, *pl.* 302.—*Wood Ind. Ent. t.* 1, *f.* 25. A. Aglaia, *Steph. Illust. Haust.* i. 39.—*Staint. Man.* i. 42.

LARVA. *Hüb. Gesch. Pap.* I. *Nymph. B. e. b.*—*Dup. Icon.* i. *pl.* 14, *f.* 46.

Appears along with the last species, and in similar localities. Castle Eden Dene, Gibside. Seaton and Shull, common.—*W. Backhouse, Esq.* "Castle Eden Dene, and in fields near Flass, beginning of July."—*Ornsby's Durham.* Twizell.—*P. J. Selby, Esq.*

3. A. SELENE, *Schiff.*

Papilio Selene, *Schiff. W. V.* 321.—*Hüb. Pap.* 26, 27, *var.* 732, 733, 783.—*Wood Ind. Ent. t.* 1, *f.* 21; *t.* 3, *f.* 3. Melitæa Selene, *Steph. Illust. Haust.* i. 34. Argynnis Selene, *Staint. Man.* i. 43.

LARVA. *Hüb. Gesch. Pap.* I. *Nymph. B. b. c.* 1.—*Dup. Icon.* i. *pl.* 17, *f.* 52.

Appears abundantly about the middle of June, and frequents the most of our woods, Gibside, Meldon Park, &c. Shull, common.—*Wm. Backhouse, Esq.* Mentioned in the list in "Ornsby's Durham."

4. A. EUPHROSYNE, *Linn.*

Papilio Euphrosyne, *Linn. S. Nat.* ii. 786.—*Hüb. Pap.* 28-30.—*Don. Brit. Ins.* xi. 51, *pl.* 312.—*Wood Ind. Ent. t.* 1, *f.* 22, and *t.* 3, *f.* 4. Melitæa Euphrosyne, *Steph. Illust. Haust.* i. 35. Argynnis Euphrosyne, *Staint. Man.* i. 43.

LARVA. *Hüb. Gesch. Pap.* I. *Nymph. B. b.* 1.—*Dup. Icon.* i. *pl.* 17, *f.* 31.

This pretty Butterfly abounds, at the end of May and early in June, in all the grassy paths in and around our woods. It precedes the last species by about a fortnight or three weeks. It is included in the list in "Ornsby's Durham."

16. MELITÆA, *Fab.*

1. M. ARTEMIS, *Schiff.*

Papilio Artemis, *Schiff. W. V.* 322.—*Hüb. Pap.* 4-6.—*Wood Ind. Ent. t.* 1, *f.* 19. Melitæa Artemis, *Steph. Illust. Haust.* i. 32.—*Staint. Man.* i. 47.

Larva. *Hüb. Gesch. Pap.* I. *Nymph, A. a.* 3.—*Dup. Icon.* i. *pl.* 21, *f.* 62.

This species has only been recently noticed within these counties, and hitherto only in Durham. In the Flass locality, I am informed by Mr. Proctor, Jun., of the Durham Museum, that it is most abundant—the food plant of the larva *Scabiosa succisa* growing there in great quantity. "In fields near Flass, and near Castle Eden Dene, at the end of May."—*Ornsby's Durham.*

It is somewhat remarkable that Wallis does not mention a single species of this sub-family. The two species, *Selene* and *Euphrosyne*, are so widely spread, and so common, that they could hardly escape his notice; and yet, equally strange, neither Mr. Selby's nor Mr. Hogg's lists include either of them.

Family 3. LYCÆNIDÆ, *Leach.*

17. Thecla, *Fab.*

1. T. Quercus, *Linn.*

Papilio Quercus, *Linn. S. Nat.* ii. 788.—*Hüb. Pap.* 368-370.—*Don. Brit. Ins.* xiii. 57, *pl.* 460.—*Wood Ind. Ent. t.* 2, *f.* 54. Thecla Quercus, *Steph. Illust. Haust.* i. 78.—*Staint. Man.* i. 53.

Larva. *Hüb. Gesch. Pap.* II. *Gens. A. c.* 2.—*Dup. Icon.* i. *pl.* 8, *f.* 30.—*Don. Brit. Ins. ut sup.*

Pretty abundant, towards the middle of August, near Gibside, flying about the summits of the Oaks, and consequently not readily captured. I know of no other locality for it, though doubtless, if looked for at the right season, and in its lofty abode, it would be found generally diffused over our Oak woods. The larva descends to the ground to undergo its change.

18. Chrysophanus, *Hüb.*

1. C. Phlæas, *Linn.*

Papilio Phlæas, *Linn. S. Nat.* ii. 793.—*Hüb. Pap.* 362, 363.—*Don. Brit. Ins.* xiii. 69, *pl.* 466.—*Wood Ind. Ent. t.* 2, *f.* 56. Lycæna Phlæas, *Steph. Illust. Haust.* i. 79. Chrysophanus Phlæas, *Staint. Man.* i. 54.

Larva. *Hüb. Gesch. Pap.* II. *Gens. A. b. c.* 1.—*Dup. Icon.* i. *pl.* 5, *f.* 16.

Of this common, gay little species, there are broods in April, June, and September, and it is to be met with everywhere in lanes, fields, and gardens. I generally notice a few of them yearly in my own suburban garden, where the larvæ doubtless find their pabulum in the sorrel *(Rumex acetosa)* occurring amongst the grass of the lawn. I once met with a larva on that plant in Elswick Lane, and bred the specimen. It is mentioned by Wallis (i. 354), who says, "The *small yellowish-red Butterfly, with black spots*, appears in shady vales and pastures in the latter end of May or the beginning of June," and truly states "the upper wings of a yellowish-red, glossy, and splendent, like a rich *sattin*." It is included in the Durham and Twizell lists.

19. Polyommatus, *Latr.*

1. P. Argiolus, *Linn.*

Papilio Argiolus, *Linn. S. Nat.* ii. 790.—*Don. Brit. Ins.* xiv. 39, *pl.* 481.—*Wood. Ind. Ent. t.* 2, *f.* 61. Pa. Acis, *Hüb. Pap.* 272-274. Polyommatus Argiolus, *Steph. Illust. Haust.* i. 85.—*Staint. Man.* i. 57.

This is the earliest of our blue Butterflies. I have met with the males as early as the 18th April, but towards the middle of May it is most abundant. It frequents woods and lanes where the holly grows, upon which the larva feeds. It is nowhere more common than around Ravensworth, where that beautiful evergreen occurs in such luxuriance and abundance. Gibside, Dilston, Winlaton Mill. Darlington, and Shull.—*Wm. Backhouse, Esq.* "Woods and lanes near Durham, Castle Eden Dene, in May."—*Ornsby's Durham.*

No figure of the larva has been published.

2. P. Alsus, *Schiff.*

Papilio Alsus, *Schiff. W. V.* 184.—*Hüb. Pap.* 278, 279.—*Don. Brit. Ins.* ix. 73, *pl.* 322, *f.* 1.—*Wood Ind. Ent. t.* 2, *f.* 62. Polyommatus Alsus, *Steph. Illust. Haust.* i. 86. *Staint. Man.* i. 57.

Larva. *Hüb. Gesch. Pap.* II. *Gens. A. b.* 1.—*Dup. Icon.* i. *pl.* 7, *f.* 25.

The smallest of our Butterflies; local, frequenting rather dry grassy places during the month of June. Marsden—Witton-le-Wear—Castle Eden Dene—old coal heap, opposite Wylam. Shull.—*Wm. Backhouse, Esq.* "Castle Eden Dene, Ragpeth, near Flass."—*Ornsby's Durham.* "Twizell"—*P. J. Selby, Esq.*

3. P. Alexis, *Schiff.*

Papilio Alexis, *Schiff. W. V.* 184.—*Hüb. Pap.* 292-294.—*Wood Ind. Ent. t.* 3, *f.* 69. Pa. Argus, *Don. Brit. Ins.* iv. 93, *pl.* 143, *mas.* Polyommatus Alexis, *Steph. Illust. Haust.* i. 91.—*Staint. Man.* i. 60.

Larva. *Hüb. Gesch. Pap.* II. *Gens. A. a. b.*—*Dup. Icon.* i. *pl.* 7, *f.* 24.

The most abundant of our small Butterflies, appearing in every grassy lane and field at the end of May, and continuing until early in July. A second brood occurs in August, and flies till late in September. Wallis says, "The small *sky-blue Butterfly* appears in the latter end of May or beginning of June, in warm vales. It is a beautiful insect of a nimble wing." It is included in the Stockton, Durham, and Twizell lists.

4. P. Agestis, *Schiff.*

Papilio Agestis, *Schiff. W. V.* 184, 13.—*Hüb. Pap.* 303-306. *Wood Ind. Ent. t.* 2, *f.* 72; *t.* 3, *f.* 9. Papilio Idas, *Haw. Lep. Brit.* 46. *Don. Brit. Ins.* x. 74, *pl.* 322, *f.* 2. Polyommatus Agestis, *Steph. Illust. Haust.* i. 94.—*Staint. Man.* i. 61.

Var. Polyommatus Salmacis, *Steph. Illust. Haust.* iii. 235. —*Wood Ind. Ent. t.* 3, *f.* 72 and 12.*

* I might perhaps have added a reference to Hübner's species *Alloüs*, pl. 200, which Mr. Doubleday informs me, some specimens of our local variety, he took to Paris some years ago, were pronounced to be by the French Entomologists. I can find no account of the specimens figured on the above plate. They represent an insect certainly closely allied to our *Salmacis*, but larger than any specimen I have seen, with the ciliæ of the anterior wings uniformly brown, without any distinct black spot on the disk, and the undersides of all the wings having all the ocelli fully developed as in the type *Agestis*. The band of orange spots on the upper side is confined to the posterior wings in one of the figures, 988, and in another 990, is entirely wanting. The former is placed by Dr. Heydenreich, in his Catalogue, as a variety of *Agestis*; and the latter as the *Idas* of Rambur, described from Andalusian specimens, which species, however, is by Dr. Herrich-Schäffer thought not distinct from *Agestis*.

Var. Papilio Artaxerxes, *Fab. Ent. Syst.* i. 297.—*Hüb. Pap.* 951-954.—*Haw. Lep. Brit.* 47.—*Don. Brit. Ins.* xvi. 1, *pl.* 541.—*Wood Ind. Ent. t.* 3, *f.* 74, and 13. Polyommatus Artaxerxes, *Steph. Illust. Haust.* i. 95.—*Staint. Man.* i. 61.

Ever since the late Mr. Stephens described the variety named by him *Salmacis*, from specimens which I gave him in 1831, it has been matter of controversy whether the Southern *Agestis*, our variety *Salmacis*, and the Scotch *Artaxerxes*, were to be considered as really three distinct species, or as forming two, or only one, and if two, to which of them ours was to be attached. Various theories and speculations have been hazarded both to unite and to separate them; but they appear in the British Museum list as all three distinct, and in the others, Continental as well as British, *Agestis* and *Artaxerxes* are kept apart. It is only after much consideration and the consultation of all the authorities I have access to, as well as the communications of some of our best Lepidopterists in distant and distinct parts of England and Scotland, that I have ventured to unite them as above. The discovery and careful comparison of specimens or trustworthy drawings of the larvæ of all the three can alone finally and surely settle the point. That of *Artaxerxes* we owe to the patient researches of Mr. Logan, who found it feeding on the *Helianthemum vulgare*, growing on Arthur's Seat, near Edinburgh (its original locality), and reared the perfect insect whose transformations will most appropriately form the subject of the first plate of his forthcoming "Illustrations of Scottish Lepidoptera." That of the type *Agestis* has been figured by Mr. Westwood, in his "British Butterflies;" and, in reply to my inquiries, he states it must have been copied from some work, of which he had forgotten the particulars. Mr. Harding, a well-known collector and close observer, who alone seems to have bred *Agestis* in Britain, informs me that he has, on several occasions, taken its larva on the coast of Kent, feeding on *Erodium cicutarium;* and that, when in 1857, Mr. Logan showed him a coloured drawing of that of *Artaxerxes*, he was of opinion that they were different. On the contrary, Mr. Logan writes

me that the description given him by Professor Zeller, one of the first Lepidopterists of the day, of the larvæ feeding on the same *Erodium* from which he bred *Agestis*, as mentioned in the "Proceedings of the Entomological Society," vol. ii., N.S., p. 107, agreed entirely with that of *Artaxerxes;* and as the one statement is the result of written description by so skilful and accurate a describer as the learned Professor, and the other only of recollection, I think we must be guided by the former. It is certainly a curious coincidence that, in both instances, these larvæ should all have been found feeding on the same plant, and that, too, in localities so far apart as Kent and Glogau, and certainly is *prima facie* an argument for their specific distinctness, since the larvæ of the *Diurna* are not usually general feeders like those of many of the *Heterocera*. Still, I think, when I come to consider the locality in which this southern form is met with, it will appear very probable that, in this case, the *Helianthemum* is equally a food plant.

Of our own local insect I regret the larva has not yet been found, though, if diligently sought for on the *Helianthemum*, by some of our members resident near the place of its occurrence, I anticipate its certain discovery. This is particularly desirable from the fact that our specimens assume the characters both of the *Agestis* of the South, and of the *Artaxerxes* of the North, and therefore may reasonably be presumed to exhibit the differences, if any, existing in that state. Dr. Lowe, of Edinburgh, in a paper read before the Royal Physical Society, a copy of which I owe to his kindness, details his unsuccessful attempt to find the chrysalis when at Castle Eden Dene, in 1855; and after learning Mr. Harding's discovery, as above-mentioned, is inclined to predict that the larva will be found to feed on *Geranium sanguineum*, which, as he noticed, and as is well known, grows there in abundance. In this, I think, he is decidedly mistaken; for that plant grows in other parts of our district, where *Salmacis* has certainly not been met with, and is certainly wanting in others where the insect is found. I have not the slightest doubt but that, like *Artaxerxes*, the *Helianthemum* will as surely prove to be its food as its presence indicates the place of flight.

In such localities Mr. Sang meets with the perfect insect at Richmond, in Yorkshire, where the geranium does not grow. At Castle Eden, and along the coast, from Whitburn to Marsden (in which latter extended locality the geranium is also wanting, and where, I regret, the insect is nearly extinct from the close feeding of the rocky places where the food plant grows), it seems confined to the spots where the *Helianthemum* flourishes. Mr. Selby finds the same thing occur about Bamborough. Crossing into Scotland, where the insect seems to assume the *Artaxerxes* form exclusively, so far as the white discoidal spot of the upper wings is concerned, Mr. Hardy takes it on the Lammermuir Hills amongst the same plant. On Arthur's Seat it is confined to the place where the plant grows, and I have captured it between Pitlochrie and Loch Tummel, on rocky hill sides covered with the same gay flower. So also about Stonehaven, in Kincardineshire, its furthest northern locality yet known.

To return to the question of the differences between these so-called three species, I may observe that *Agestis* was first indicated by Scopoli, in his "Entomologia Carniolica" (1763), and the female well described as *var.* 1 of his *Alexis*. In 1776, the learned Theresians, in their celebrated "Verzeichniss," which to this day remains a monument of philosophic research and acumen, first separated it as a species under the name it still bears. In 1779, Bergsträsser, in his "Nomenclatur, &c.," describes and figures it well as *Arstarche*, drawing especial attention to its close affinity to, if not identity with, the above species of Scopoli and the Vienna authors. Both Linnæus and Fabricius seem to have confounded it with other "blues," the specific and sexual distinctions of which were then little understood; and until Hübner correctly figured both sexes under its proper name, that confusion seems to have more or less prevailed. Although Fabricius appears to have been unacquainted with Bergsträsser's work, he was evidently aware of the Theresian indication: for, in his "Entomologia Systematica emendata" (1793), he quotes every other species of "blue" given in the "Verzeichniss," and assigns them to what he considered their proper places, but omits all reference to *Agestis*. It is in this, his

great work, we first find *Artaxerxes* indicated as a species, and described "from a drawing by the hand of William Jones, Esq., of Chelsea."* Thus matters stood till 1803, when our eminent Lepidopterist, the late A. H. Haworth, published the first portion of his celebrated "Lepidoptera Britannica," in which *Agestis*, under the name of *Idas*, Lewin, and *Artaxerxes*, were first both fully described and contrasted. It is well known this author described from nature, and I may, therefore, be allowed to give his diagnoses and some extracts from his descriptions. The former, *Agestis* (his *Idas*), he thus characterises: "Alis supra in utraque sexu fuscis maculis marginalibus rufis, subtus cinereis punctis ocellaribus," adding in his description, "puncto nigro disci primorum, ordineque communi macularum rufarum ad marginem posticum, ciliis albis." Of the latter, *Artaxerxes*, almost in the very words of Fabricius,† he says: "Alis nigris, anticis puncto medio utrinque albo, posticis lunulis rufis, subtus margine albo rufo punctato;" and he then proceeds to describe it from a specimen taken in Scotland, and sent him by Dr. Skrimshire, a well-known Aurelian of that period. We may observe the difference from his adopted diagnosis and note his carefulness in his own description of this single specimen. He says: "Præcedenti (*Idas*) simillima at minor, maculis albis sine pupilla, subtus loco ocellorum. Alæ supra fuscæ fascia communi lunularum rufarum ad marginem posticum punctoque albo disci primorum utrinque. Subtus cinerascentes, anticæ fascia postica alba ex maculis 6 contiguis; pone has maculis 5 itidem contiguis transversis rufis, singulis utrinque lunula minuta nigra alteraque alba munitis: linea marginali atra et ad terminos venarum latius atra seu quasi punctata, ciliis albis, alæ posticæ subtus fere ut in præcedente sed maculis rotundis albis epupillatis loco ocellorum." Thus, in reality, he makes the essential difference between them to consist in the one having a black spot on the disk of the anterior wings and ocellated spots beneath, and the other having a white spot on the disk of both sides of the anterior wings, and white spots, without pupils beneath, since all the rest of his

* Don. Brit. Ins. l. c.

† H. R. Alis integerrimis nigris; anticis puncto medio albo, posticis lunulis rufis, subtus margine albo rufo punctato.—*Fab. E. S. ut supra.*

description applies equally to both; and the white discoidal spot underneath, in *Artaxerxes*, is in fact replaced in *Agestis* by a discoidal ocellus.

So rare, however, was this Scotch butterfly, that Donovan tells us, in 1813 (when he figured it), that, with the only other exception of Mr. Macleay's, all the London cabinets had drawings made of it, and neatly pinned into their drawers as a substitute. Just at that period our celebrated countryman, the late Dr. Leach, had entered on his studies at Edinburgh, and soon found it in abundance; and from that locality all the cabinets of Europe have been supplied, and Scotland considered its only native country. When, a little more than thirty years ago, a few Entomologists sprung up here, we were, in 1827, not a little gratified by the capture of both the so-called species on our own coast, and Mr. Stephens announced this the first appearance of *Artaxerxes* in England—(except a single specimen hereafter referred to)—in his "Illustrations," in which he added to his description, doubtless from a Scotch specimen, a variety β—"the white spots on the under-surface of all the wings, with minute black pupils," and alluded to its variation, "like its congeners in the number and disposition of the white spots on the inferior margin of the wings, as well as in the width and obliteration of the orange marginal fascia."—He thus removed every distinction, as a species, except the white discoidal spot of the anterior wings. After this time specimens from our localities were generally dispersed amongst the cabinets of Britain; and from a number of these, given by me to the late Mr. Stephens, as mentioned above, he thought he detected a species intermediate between *Agestis* and *Artaxerxes*, which he happily named *Salmacis;* and, in the 3rd vol. of his "Illustrations," p. 235, published in May, 1831, thus characterised: "Alis fusco-nigris, subtus fuscescentibus maculis subocellatis, anticis supra in masculis puncto discoidali atro, in fœminis albo, posticis utrinque fasciâ submarginali rubrâ;" and from that period to the present, as above stated, the dispute as to the three insects has existed. My impression at that time was that ours was really distinct, but I had then seen only few specimens of

either the southern or the northern form, and the double appearance of the former strengthened that opinion. In a communication to the "Entomological Magazine," in July, 1832 (vol. 1, p. 42), I stated, as the result of my collecting, that Mr. Stephens was in error in his diagnosis, as "neither sex possessed exclusively either the white or black spot;" and, indeed, amongst my specimens were several of a truly hybrid form, having a white discoidal spot, with a black centre. In the latter part of 1834, Mr. Newman, in the same Magazine (vol. 2, p. 515), advanced an opinion, that all three were one, though I certainly think on insufficient grounds. Having soon after this time ceased to pursue Entomology for some twenty years, I took no active interest in the matter, and during that interval an occasional doubt or surmise by others appears to have been all the attention bestowed upon the question. There is only one other descriptive work I need refer to, Mr. Stainton's useful Manual (1856), where of *Agestis* he says: "Rich brown, with a marginal band of orange spots. Fore-wing, a central black spot. Underside, white spots with black centres;" and of *Artaxerxes*: "Rich brown, with a more or less distinct marginal band of orange spots. Fore-wing, a white central spot. Underside, white spots without black centres;" and gives, amongst the localities for the latter, "Castle Eden Dene and Richmond, Yorkshire," to include our *Salmacis*.

Let us now consider the points of distinction relied on. They seem to be—*first*, The marginal band of orange spots; *secondly*, The black or white spot on the upper wings; and, *thirdly*, The ocellated or non-ocellated white spots on the underside. As to the first, there is no doubt that this band of orange spots is generally most fully developed in the southern localities; but the supposition, that it always decreases as we proceed northwards, is certainly erroneous; for some of the finest and most brilliant specimens in this particular that I have seen are from parts as far north as Liverpool, from our own district, and from Edinburgh; those from the two latter localities bearing the white spot of *Artaxerxes*. We may therefore, I think, safely dismiss this band as any criterion of specific difference.

Next, as to the black or white spot on the upper wings. It would appear that throughout the Continent of Europe, widely diffused as I shall hereafter shew *Agestis* to be, not a single specimen has been recorded as deviating from the type, even in latitudes much colder than our own, whereas, in Britain, it extends northwards as far as our most northern local habitat, Bamborough, mingled from Richmond, in Yorkshire, with the *Artaxerxes* form. Even in the most southern parts of our island we have a few examples recorded which link the types together. The oldest, I quote from Stephens' work, under *Artaxerxes*—"I once observed it on Dartmoor, 23rd August, 1823.—*Dr. Leach;*" and Mr. Stainton, in his Manual, under *Agestis* says: "A singular variety, with a white spot on the upperside, in the centre of the forewing, was taken near Brighton, last July (1855), by Mr. H. Cooke. The underside entirely agreed with the ordinary appearance of *Agestis*." Mr. Bond, one of our best out-of-door Naturalists, and an excellent Lepidopterist, informs me that he has occasionally seen a specimen in the South, with a small white spot on the wing." Mr. Vaughan says "he once took a specimen near Bristol, with a clear white ring round the black dot in the anterior wing; and Mr. Sircom, in a communication to the "Zoologist," 1844 (p. 773), mentions other similar cases in the South. From Yorkshire, northwards, these white-spotted specimens are numerous, and ultimately, it would seem, the only form we have. I think, therefore, we may reasonably conclude that the presence of a white or of a black spot will not suffice to establish the fact of there being two species.

Finally, we have to consider the point of ocellated or non-ocellated spots on the underside; in other words, whether the absence or the presence of minute black dots in the centres of the white spots underneath be sufficient to divide the specimens into two species. I may premise that the presence of this black dot in the discoidal spot of the underside of the anterior wings destroys the Fabrician and Haworthian "puncto medio utrinque albo," as well as Stephens' "utrinque maculâ discoidale albâ," at once; and yet the latter author seems to have overlooked the fact that his variety β, as given above, necessarily had this effect! The ex-

amination of all our British Polyommati, with their varieties, and of the best figures of the European species, convinces me that the only spots or ocelli that are never wanting are those placed at the apex of the discoidal cell of each wing, and, consequently, that either the absence or the presence of any one or more of the others, and, *à fortiori*, their having pupils or not, affords no unvarying specific character. I might enlarge upon this point, but refrain, and proceed rather to apply the proposition to the insect before us. Mr. Gregson, of Liverpool, one of our most observant Lepidopterists, is of opinion, founded on his long and wide spread experience in collecting, that the full development, and also the brightness of the ocelli in these insects, depend much upon the warmth of the season of their appearance in the perfect state. According to this law, which certainly obtains amongst insects generally, when undisturbed by local causes, we might expect, and in fact find, that, in the southern form of *Agestis*, the ocelli are the most brilliant, having the black centres large and perfect. Still this is not always so, for not only are some of those centres suppressed, but in many cases one or more of the ocelli are entirely wanting. In our own locality, where the connecting form *Salmacis* first appears in any numbers, and where hundreds of specimens have passed through my hands, the majority bear the impress of the southern type, though few of them have the ocelli so brilliant as in specimens from that part of England. These ocellated specimens are not confined to such as have either the white or the black discoidal spot on the upperside, but seem to occur indiscriminately. By far the most interesting variety I have yet seen of this butterfly is one in my own cabinet, which I captured, in July, 1856, at Castle Eden, having the spot on the upper wing white, with a black centre. Underneath, the only spots within the orange band on its upper wings, are the discoidal—white, with a small black centre,—all the others being entirely obliterated on one wing; whilst, on the other, there is the sole addition of a most minute one between the third and fourth nervures. On both underwings, with the exception of the discoidal spot, and the usual triangular blotch, every trace of ocelli within the same

band is wanting. Taking next the Scotch form, we find, that although the great bulk of the specimens have the black centres of the ocelli suppressed, still they are not always so; for not a few that I have examined possess them, and it is probable that one of these latter specimens furnished Mr. Stephens with his variety β. We see, therefore, that the variation of these ocelli, or spots, instead of furnishing a means of separating the *Agestis* form from the *Artaxerxes*, in reality links them together, and, by means of *Salmacis*, completes their identity.

Thus we find all the three points of supposed specific distinction fail when rigidly tested, and the discovery of the larva of *Agestis* feeding on the *Helianthemum* alone needed to settle the point beyond doubt or question; for Mr. Bond informs me he has in his cabinet a chrysalis of the southern *Agestis*, which is exactly like one of *Artaxerxes* sent him by Mr. Logan. Nor do I think this discovery at all unlikely. The domestic habits—if the expression may be allowed—of the *Polyommati* are well known to all Entomologists. They never roam far from home, like most of our Butterflies, but confine their flight to a few yards around their native places. Now, Mr. Logan has proved the connection that exists between the larva of *Artaxerxes* and this plant, and I have traced the range of it and our *Salmacis* in conjunction therewith from Richmond to Kincardineshire. Let us notice how far a similar connection appears to hold good with *Agestis*. It is somewhat remarkable that long before the above facts as to *Artaxerxes* had even been suspected, the southern *Agestis* and the *Helianthemum* were associated together. Dr. Jordan, in a communication to the "Zoologist" for 1844 (p. 348), on the occurrence of the *Polyommati* in South Devon, says: "*P. Agestis*, double-brooded, May and August; local; frequents rocky places in woods. I took it in considerable plenty in Bradley Woods, near Newton, Devon, settling on the flowers of the *Helianthemum vulgare*, though I did not see a single specimen until I came to the rock where this plant was growing." In reply to my inquiries as to this point, Mr. Cooke writes me: "I have never taken *Agestis*, except in localities where the *Helianthemum* grows freely. The wild Geraniums do grow here

(Brighton), and in many of the localities where *Agestis* is taken, but they occur only sparingly, and in one spot, where I take my finest specimens, and where indeed I caught the curious variety you allude to (mentioned above), I have reason to believe the Geraniums do not grow at all." Further, I may add that Mr. Gregson, who has taken it in North Lancashire, Cheshire, Derbyshire, Yorkshire, Lincolnshire and Wales, says: "I have never taken *Agestis*, except where the *Helianthemum* grows." I might multiply these instances, but refrain. They are pretty strong indications that the larva of the southern form finds equally with the northern one a pabulum in this plant.

Having gone so far into the history of this insect, it may not be amiss to examine into the geographical distribution of the two forms it assumes, and endeavour to reconcile some differences as to its times of appearance in the perfect state. As I have intimated above, the white-spotted variety, *Artaxerxes*, seems entirely confined to Britain, ranging from Richmond (54½° N.L.) to Kincardineshire (57° N.L.); and in Scotland from sea to sea —Dumfries and Ayrshire to St. Abb's Head and Stonehaven. Throughout all this district, as with us, it appears only once in the season, from the latter end of June to the latter end of July. Mr. Logan has *once* met with it in August. The black-spotted variety, *Agestis*, has a wide European range, from Gibraltar in the south (36° N.L.) to Upsala in the north (60° N.L.), and from England on the west, to the Ural Mountains, the confines of Asia, on the east. In England as far north as London and Bristol, it seems to be double-brooded, May and August; whilst at Liverpool and so northwards, only single, making its appearance simultaneously with the *Artaxerxes* form here, and in Scotland during June and July. On the Continent, with the exception of Italy, it is included in the lists of every country I have access to, but unfortunately few of these works state its times of appearance with the minuteness one could wish, and to these latter only need I refer. Godart in his great work, vol. 1, p. 213, gives it two broods, in spring and in summer, and says it is very common in France. Dr. Boisduval, our first authority in the *Diurna*, in his "Index Methodicus" (1829), says: "Europâ, Maii,

Augusti." Again, Duponchel, in his "Catalogue Méthodique" (1846), assigns the same two months. M. Bruand, who has done much towards the natural history of the Lepidoptera in his valuable "Catalogue des Lépidoptères du Department du Doubs" (1846), states the same months as the time of its appearance there. De Graaf, in Herklot's "Bouwstoffen vor eene Fauna van Nederland" (vol. 1, p. 221, 1853), gives May, and June, and August, and September, for its flight in South Holland. Treitschke, who may be said to speak for Austria and Germany, in his "Hülfsbuch" (1833), gives August and September. No doubt the time of the second brood. Eversmann, in his "Fauna Lepidopterologica Volgo-Uralensis" (1844), states that about Casan (55° N.L.) June and July is its time on the wing; and Dalman, in his clever "Försök till Systematisk uppställung af Sveriges Fjärillar" (K.V.A. Hand. 1816), observes: "Hab. apud nos rarius. Prope Upsalium, &c., mihi obvius mensibus Junio et Julio." Of our British authors, Haworth *l. c.* says end of May and middle of July; and Stephens *l. c.* beginning of June and middle of August. Mr. Stainton says May and August. Apparently, therefore, we have have two distinct seasons for it, though Mr. Bond informs me he has met with a few specimens in the intermediate months; but M. Guenée, to whose authority we must all submit, in his admirable introduction to the 9th vol. of his "Species général des Lépidoptères," just from the press, on this point says: "Quant aux doubles générations, si souvent affirmées ou démenties par les auteurs, elles restent, comme dans les autres divisions subordonnées à la latitude, et souvent aussi à la température variable de certaines années. Ce serait donc un tort d'y attacher une très grande importance." This source of difference need not therefore raise any difficulty as to the insect being identical in all its localities. It may not, however, be uninteresting to state that, if we draw an isothermal line of 51 degrees across the map of Europe, we seem to separate the single from the double broods by its track. On the south of such a line we shall find Bristol, London (50·7°), South Holland (Brussels, 50·4°), all France, and Vienna (50·2°), the region of the

double broods; whilst the other localities, Manchester (47·7°), Newcastle (47°), Edinburgh (46·6°), Upsala (40°), and Casan, (35·8°), where we know the insect only appears once in the year, are to the north.

From all these facts and circumstances, I think I am justified in uniting the three forms of this butterfly under the single name of *Agestis;* and in doing so it affords me great satisfaction to be enabled to state that our first British Lepidopterist, Mr. Doubleday, to whom I have submitted these remarks, concurs.

I regret the length to which this digression has run, but as the cause of the dispute arose from our local specimens, I think our Transactions are the proper place to record an attempt to settle it.

Family 5. HESPERIDÆ, *Leach.*

20. Nisoniades, *Hüb.*

1. N. Tages, *Linn.*

Papilio Tages, *Linn. S. Nat.* ii. 795.—*Hüb. Pap.* 456, 457. —*Wood Ind. Ent. t.* 3, *f.* 76. Thymele Tages, *Steph. Illust. Haust.* i. 98. Thanaos Tages, *Staint. Man.* i. 65.

Larva. *Hüb. Gesch. Pap.* II. *Gens. E.* 1. *and E. a.* 2.—*Dup. Icon.* i. *pl.* 32, *f.* 93.

Common in most parts of the counties in dry lanes and on heaths at the end of May and during June. A second brood in August. It is enumerated in the Twizell fauna and in Ornsby's Durham.

21. Pamphila, *Fab.*

1. P. Sylvanus, *Fab.*

Hesperia Sylvanus, *Fab. E. S.* iii. 1, 326.—*Hüb. Pap.* 482-484. Papilio Sylvanus, *Don. Brit. Ins.* viii. 8, *pl.* 254, *f.* 25.—*Wood Ind. Ent. t.* 3, *f.* 80. Pamphila Sylvanus, *Steph. Illust. Haust.* i. 101.—*Staint. Man.* i. 68.

The only species of the genus yet met with in these counties, although I expect to add at least another (*P. Comma*) before my catalogue is complete; but the evidence is not at present suffi-

cient to justify me in transporting it even the few yards necessary to bring it across the Tees, on the Yorkshire shore of which river, near Darlington, it has been captured by Mr. Backhouse, who, however, cannot be sure that he has taken it in Durham. *P. Sylvanus* appears at the end of May, and again in August. Scarce and local near Darlington.—*Mr. Sang.* "Castle Eden Dene."—*Ornsby's Durham.*

The larva is unknown.

In closing my list of our Butterflies, I would observe that of the entire number of British species, sixty-five, we can lay claim to thirty-five as having occurred within the two counties. Of two thers, *Argynnis Adippe* and *Pamphila Comma*, I only want direct evidence of their certain *capture* within our limits to add them at once to the catalogue. Of the remaining twenty-eight, fourteen are so very rare, or so very local, and evidently so entirely confined to southern climes, that we cannot look for their occurrence with any reasonable hopes of success. As to the others, I may, perhaps, be excused for directing the attention of the members of the Club to localities which appear to me to hold out a prospect of adding some of them, at least, to our numbers.

I have alluded above to *Erebia Cassiope* and its probable occurrence on the *green* hills (porphyritic) of the Coquet and the Cheviots. That portion of the range commencing about Redlees, and extending northwards past the Bygate Hall estate, belonging to our very assiduous member Ralph Carr, Esq., and so over towards Alnham, and the sources of the Alwine and Bremish appear to me to offer the greatest chances for its capture.

The region occupied by the magnesian limestone, and the new red sandstone extending from Marsden and Boldon to the south-eastern extremity of Durham is, however, by far the most promising ground for examination for species new to our fauna. The numerous habitats within its limits for our present species, as given above, show unmistakeably how prolific it is in Butterflies as in other insects, as well as plants, mollusca, &c.; in fact it is the "chalk district" of our counties. Here, in meadows and

on commons, *Arge Galathea* and *Polyommatus Ægon*, both abundant near York, are pretty certain to be met with, and *P. Corydon* and *P. Adonis* are not beyond the range of possibilities. *Leucophasia Sinapis*, *Melitæa Athalia* (on the continent, seemingly the usual companion of our *M. Artemis*); *Thymele Alveolus* and *Pamphila Linea*—the two latter also near York—and, perhaps, *Nemeobius Lucina* may, I think, be successfully looked for in and about woods. Whether the extensive morasses of Morden Cars may once more restore to us the nearly, if not quite, extinct *Chrysophanus Dispar*, no one can predict; but it is the only locality we have which offers the slightest chance, and it often reminds me of the once far-famed Yaxley and Whittlesea Meres, the former abode of this splendid "Copper," now, alas! like our own Prestwick Car, "thorough drained."

The sheltered spots on the Devil's-water, and the woods around Dilston, appear to me likely to supply us with *Thecla Rubi*, and probably *Leucophasia* and *Thymele*, and Chevington Woods, and those of the Coquet and Wansbeck, are, in my opinion, equally promising.

The re-discovery of *Vanessa Polychloros* is much to be wished, and its presumed old locality, North Tyne, seems as likely as any to enable us to verify old Wallis' statements.

These hopes, of future additions to our list of Butterflies, depend much on the co-operation of our country members for their realisation, and to them these remarks are chiefly addressed. Butterflies, more than any other insects, attract the attention of the most casual observer of nature, and almost force themselves upon our notice when in the country. I trust this appeal will induce some of those enjoying the privilege of rural life to communicate to me specimens of any they are unacquainted with that may fall in their way, which I shall have much pleasure in naming for them, as in this manner, not only may new additions be made to our fauna, but additional localities of our known species be recorded in our Transactions.

2. HETEROCERA, *Bois.*

Div. I. LEPIDOPTERA CREPUSCULARIA, *Latr.*

Family 1. ZYGÆNIDÆ, *Leach.*

22. Procis, *Fab.*

1. P. Statices, *Linn.*

Sphinx Statices, *Linn.* ii. 808.—*Hüb. Sphin.* i. 144.—*Wood Ind. Ent. t.* 4, *f.* 1. Ino Statices, *Steph. Illust. Haust.* i. 106.—*Curt. B. E.* ix. *t.* 396. Procis Statices, *Staint. Man.* i. 78.

Larva. *Hüb. Gesch. Sphin.* I. *Pap. A. a.* 1., and *A. a. b.* 1.

Very abundant, in June, on the lawn, near the chapel at Gibside, where the specimens are all of the blue green variety; and also on the sea-banks at Castle Eden, where nearly every one is of the bright copper variety. "In a field near Flass. On the sea-banks, near Castle Eden Dene, middle of June."—*Ornsby's Durham.*

23. Anthrocera, *Scop.*

1. A. Trifolii, *Esp.*

Sphinx Trifolii, *Esp. S.* ii. 123, *t.* 34. *Cont.* ix. *f.* 45.—*Hüb. Sphin.* 134, 135. Zygæna Trifolii, *Bois. Monog. Zyg.* 54, *pl.* 3, *f.* 7. Anthrocera Trifolii, *Steph. Illust. Haust.* i. 108.—*Staint. Man.* i. 80.

Sea-banks, near the Spanish Battery, Tynemouth; in June. Shull, abundant.—*W. Backhouse, Esq.* Gibside.—*Mr. J. Hancock.*

2. A. Filipendulæ, *Linn.*

Sphinx Filipendulæ, *Linn. S. Nat.* ii. 805.—*Hüb. Sphin.* 31, and 166.—*Don. Brit. Ins.* i. 17, *pl.* 6.—*Wood. Ind. Ent. t.* 4, *f.* 6. *var.* Zygæna Filipendulæ, *Curt. B. E.* xii. *t.* 547.—*Bois. Monog. Zyg.* 59, *pl.* 4. *f.* 1. Anthrocera Filipendulæ, *Steph. Illust. Haust.* i. 111.—*Staint. Man.* i. 81.

Larva. *Hüb. Gesch. Sphin.* I. *Pap. B. c.* 1. *c.*—*Curtis, B.E. ut supra.*—*Don. Brit. Ins. ut supra.*

Apparently more generally diffused than the last species, appearing two or three weeks later. Gibside; on the sea-banks at Tynemouth, Marsden, Whitley, Seaton Sluice, and Castle Eden. Shull, Seaton Carew, &c.—*Wm. Backhouse, Esq.* Darlington.—*Mr. Sang.* Sea-banks, Ryhope Point.—*E. Backhouse, Jun., Esq.*, who has shown me a beautiful variety captured, rarely, there, in which the red of the spots on the upper wings, and the entire under wings, except the usual margin, is replaced by a bright orange yellow. "Twizell."—*P. J. Selby, Esq.*—*Ornsby's Durham.* "Not unfrequent on plants in hedges in the months of June and July. Very common on the bents at Seaton Snook."—*J. Hogg, Esq.*

Family 2. SPHINGIDÆ, *Leach.*

24. Smerinthus, *Latr.*

1. S. Ocellatus, *Linn.*

Sphinx Ocellatus, *Linn. S. Nat.* ii. 796.—*Don. Brit. Ins.* viii. 47, *pl.* 269.—*Wood. Ind. Ent. t.* 4, *f.* 7. Sph. Salicis, *Hüb. Sphin.* 73. Smerinthus Ocellatus, *Steph. Illust. Haust.* i. 112.—*Curt. B. E.* xi. *t.* 482.—*Staint. Man.* i. 87.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. D. a.* 2, and *D. a. b.* 1.—*Dup. Icon.* ii. *Crepus. pl.* 7. *f.* 1.—*Don. Brit. Ins. ut supra.*—*Curt. B. E. ut supra.*

Once near Darlington.—*Mr. Sang.* Far from rare in Yorkshire.

2. S. Populi, *Linn.*

Sphinx Populi, *Linn. S. Nat.* ii. 797.—*Hüb. Sphin.* 74.—*Don. Brit. Ins.* vii. 67, *pl.* 241.—*Wood Ind. Ent. t.* 4, *f.* 9. Smerinthus Populi, *Steph. Illust. Haust.* i. 112.—*Staint. Man.* i. 87.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. D. a.* 1, and *D. a. b.* 2.—*Dup. Icon.* ii. *Crepus. pl.* 7, *f.* 2.—*Don. Brit. Ins. ut supra.*

Widely diffused, and frequently met with, in the two counties. Newcastle, Tynemouth, Meldon Park, &c. Darlington. —*Wm. Backhouse, Esq.* Not unfrequent at Sunderland.—*E. Backhouse, Jun., Esq.* "Twizell."—*P. J. Selby, Esq.* "Not very unfrequent in some years about Norton."—*J. Hogg, Esq.*—*Ornsby's Durham.*

25. Acherontia, *Och.*

1. A. Atropos, *Linn.*

Sphinx Atropos, *Linn. S. Nat.* ii. 799.—*Hüb. Sphin.* 68.—*Don. Brit. Ins.* ix. 3. *pl.* 289.—*Wood Ind. Ent. t.* 4, *f.* 10. Acherontia Atropos, *Curt. B. E.* iv. *t.* 147.—*Steph. Illust. Haust.* i. 114.—*Staint. Man.* i. 88.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. C. a.* and *C. a. b.*—*Dup. Icon.* ii. *Crepus. pl.* 6.—*Don. Brit. Ins.* ix. *pl.* 290.—*Curtis B. E. ut supra.*

The well-known "Death's Head Moth," the "Tête de mort" of the French, and "Todtenkopf" of the Germans. A source of fear and alarm amongst the ignorant and superstitious of all countries, as well from the ominous skull pourtrayed on its thorax, as from the noise it makes when handled. The short haustellum in the insects of this and the last genus, requires them, unlike the others of the family, to alight before they can feed. This species is very fond of resorting to bee-hives to steal the sweets there, and is supposed, by its imitation of the note of the queen bee, to prevent the workers injuring it whilst robbing them of their treasures. Hence, in former times, it obtained the name of the "Bee Tiger Moth." Wallis says of it, I. p. 358, "The large and beautiful Moth, called the *Bee Tiger*, was taken some years ago in one of the rooms at Felton Hall, in October. It is now in the collection of Mrs. Thompson, in Northumberland Street, in Newcastle-upon-Tyne."* In some years the larvæ are abundant in potatoe fields, towards the end of August and in September. The Moth appears generally in a few weeks, and has occurred in various parts of the counties. Darlington and Shull. —*Wm. Backhouse, Esq.* Darlington.—*Mr. Sang.* Once on the

* This lady appears to have collected various objects of our local Fauna, and is often referred to by the Rev. author. What has become of the collection I cannot learn.

rocks, near the middle of Cullercoats sands, 18th September, 1831.—*Mr. A. Hancock.* "Twizell."—*P. J. Selby, Esq. Ornsby's Durham.* "Not uncommon in Durham; once taken four miles at sea; a second buzzing about a bee-hive. Mr. J. O. Backhouse."—*Stephens' Illust. l. c.*

26. Sphinx, *Linn.*

1. S. Convolvuli, *Linn.*

Sphinx Convolvuli, *Linn. S. Nat.* ii. 798.—*Hüb. Sphin.* 70. *Don. Brit. Ins.* vii. 31, *pl.* 228.—*Wood Ind. Ent. t.* 4. *f.* 11.—*Steph. Illust. Haust.* i. 119.—*Staint. Man.* i. 89.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. C. b.* and *C. c.* 1.—*Dup. Icon.* ii. *Crepus. pl.* 1. *f.* 2.—*Don. Brit. Ins. pl.* 229.

Occasionally met with in autumn. Darlington and Shields.—*Wm. Backhouse, Esq.* Darlington, in 1855.—*Mr. Sang.* Near Belford.—*P. J. Selby, Esq.*

27. Deilephila, *Och.*

1. D. Galii, *Schiff.*

Sphinx Galii, *Schiff. W. V.* 42.—*Hüb. Sphin.* 64.—*Wood Ind. Ent. t.* 4, *f.* 15. Deilephila Galii, *Steph. Illust. Haust.* i. 125, *pl.* 12, *f.* 2.—*Staint. Man.* i. 94.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. B. d.* 1, *and B. d.* 2.

Rarely met with, but probably more abundant than supposed, if sought for on the sea coast, where the food of the larva, *Galium verum*, abounds. Twizell, twice.—*P. J. Selby, Esq.* Embleton.—*Robert Embleton, Esq.*

2. D. Livornica, *Esp.*

Sphinx Livornica, *Esp. S.* ii. 87-196, *t.* 8, *f.* 4.—*Hüb. Sphin.* 65.—*Wood Ind. Ent. t.* 4, *f.* 16. Deilephila lineata, *Steph. Illust. Haust.* i. 126, *pl.* 12, *f.* 1. D. Livornica, *Staint. Man.* i. 94.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. B. c.*

Once at Sunniside, Sunderland, many years ago.—*E. Backhouse, Jun., Esq.*

28. Chærocampa, *Dup.*

1. C. Celerio, *Linn.*

Sphinx Celerio. *Linn. S. Nat.* ii. 800.—*Hüb. Sphin.* 59.—*Don. Brit. Ins.* vi. 25, *pl.* 190.—*Wood Ind. Ent. t.* 4, *f.* 17. Deilephila Celerio, *Steph. Illust. Haust.* i. 128. Chærocampa Celerio, *Staint. Man.* i. 96.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. B. a. b.*—*Don. Brit. Ins. pl.* 191.

A few specimens only have been captured in the district, and all of them in or about dwelling houses. Mr. Stainton suggests they are attracted thither by light. One, many years ago, in the late Mr. Crighton's house, in Northumberland Square, North Shields. One at Darlington, in a room.—*Mr. Sang.* In a room in Gallowgate, Newcastle, in 1846.—*Mr. John Hancock.* One at rest between the folds of a dishcloth, hung up to dry outside a house in Bishopwearmouth.—*E. Backhouse, Jun., Esq.*

2. C. Porcellus, *Linn.*

Sphinx Porcellus, *Linn. S. Nat.* ii. 801.—*Hüb. Sphin.* 60.—*Don. Brit. Ins.* iv. 55, *pl.* 314.—*Wood Ind. Ent. t.* 4, *f.* 19. Deilephila Porcellus, *Steph. Illust. Haust.* i. 131. Chærocampa Porcellus, *Staint. Man.* i. 97.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. B. b.* 1.—*Dup. Icon.* ii. *Crepus. pl.* 5, *f.* 1.

Several years ago, towards the end of July, I met with a number of the larvæ of this species, on the sandy links which skirt the Herd Sand, feeding on the *Galium verum* which is so abundant there, and from them reared a good many specimens. The day was wet and gloomy, and my capture was made early in the morning. The following day, a fine, bright sunny one, I returned in search of more, and could not see one; but, on turning over the sand at the root of the plants, I succeeded in obtaining a few. From this I infer that these larvæ, and probably those of the other rarer Sphingidæ, are nocturnal feeders, and retire under ground for protection during the day. The dull gloom of the day on which I first met with them had evidently tempted them to

prolong their repast, and led to their capture. This habit of retiring under the soft sand of the sea links induced my late friend, Captain Charles Blomer, one of our most successful Lepidopterists, who, amidst the dangers and hardships of Abercromby's celebrated Egyptian campaign, of which he was one of the last surviving officers, eagerly pursued this, his favourite study, to adopt, with great success, the plan of using a common garden rake in such places, to expose the larvæ and pupæ. It is probable that searching for the larvæ will prove, as with the Micro-lepidoptera, the best way of procuring specimens of all the true Sphingidæ; for the short time of their twilight flight, its amazing velocity, and the fact of their always feeding on the wing, renders their capture in the perfect state, in most instances, accidental. The sea coast seems to be their favourite haunt, and where the honied sweets lay deeply hidden and out of the reach of other insects, as in the flowers of the honeysuckle, the jasmine, and, of late years, the petunia, they alone, with their long trunks, are able to extract the treasure, and in such situations they have been usually met with when taken in flight. Seaton Carew.—*Wm. Backhouse, Esq.* Twizell, not uncommon.—*P. J. Selby, Esq.*

3. C. Elpenor, *Linn.*

Sphinx Elpenor, *Linn. S. Nat.* ii. 801.—*Hüb. Sphin.* 61.—*Don. Brit. Ins.* iv. *pl.* 122.—*Wood Ind. Ent. t.* 4, *f.* 18. Deilephila Elpenor, *Steph. Illust. Haust.* i. 132. Chærocampa Elpenor, *Staint. Man.* i. 96.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. B. b.* 2.—*Dup. Icon.* ii. *Crepus. pl.* 5, *f.* 2.—*Don. Brit. Ins. ut supra.*

Hitherto rarely met with. A single specimen taken near Newcastle, several years ago. Once at Twizell.—*P. J. Selby, Esq.* A common southern species.

Family 3. SESIIDÆ, *Steph.*

29. Macroglossa, *Scop.*

1. M. Stellatarum, *Linn.*

Sphinx Stellatarum, *Linn. S. Nat.* ii. 803.—*Hub. Sphin.* 57, 155.—*Don Brit. Ins.* vii. 41, *pl.* 155.—*Wood. Ind. Ent. t.*

4, *f.* 20. Macroglossa Stellatarum, *Steph. Illust. Haust.* i. 133.—*Curt. B. E.* xvi. *t.* 747.—*Staint. Man.* i. 98.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. A. b. c.* 1.—*Dup. Icon.* ii. *Crepus. pl.* 11, *f.* 2.—*Don. Brit. Ins. ut supra.*—*Curtis B. E. ut supra.*

Its large size, and flight during the day in the bright sunshine, like the other insects of the family, causes it to be more generally noticed than any of our Sphinginæ. Far from rare, especially about the sea side, Tynemouth, Cullercoats, &c., where it is to be met with from May to the end of September. The larvæ feed on the *Galium verum*, and are pretty abundant where that plant grows. Darlington.—*William Backhouse, Esq.* "Twizell."—*P. J. Selby, Esq.*—*Ornsby's Durham List.*

30. Sesia, *Fab.*

1. S. Bombiliformis, *Esp.*

Sphinx Bombiliformis, *Esp. S.* ii. 180, *t.* 23.—*Hüb. Sphin.* 56. Sphinx Fuciformis, *Wood Ind. Ent. t.* 4, *f.* 22. Sesia Fuciformis, *Steph. Illust. Haust.* i. 134. Sesia Bombiliformis, *Curt. B. E.* i. *pl.* 40.—*Staint. Man.* i. 99.

Larva. *Hüb. Gesch. Sphin.* III. *Leg. A. a.* 1.—*Dup. Icon.* ii. *Crepus. pl.* 11, *f.* 1.—*Curtis B. E. ut supra.*

Probably more generally diffused over the two counties than supposed, as the food plant of the larvæ, *Scabiosa succisa*, is plentiful with us. Shull.—*William Backhouse, Esq.* Once at Twizell.—*P. J. Selby, Esq.* "Near Flass, end of June."—*Ornsby's Durham.*

Family 4. ÆGERIIDÆ, *Steph.*

31. Sphecia, *Hüb.*

1. S. Apiformis, *Linn.*

Sphinx Apiformis, *Linn. S. Nat.* ii. 804.—*Lewin, Trans. Linn. Soc.* iii. 1, *pl.* 1, *f.* 1, 2.—*Don. Brit. Ins.* i. 55, *pl.* 25.—*Wood Ind. Ent. t.* 4, *f.* 23. Sphinx Crabroniformis, *Hüb. Sphin.* 51. Trochilium Apiformis, *Steph. Illust. Haust.* i. 137.—*Curt. B. E.* viii. *t.* 372, *f.* **—*Staud. Ses. Berol.* 40. Sphecia Apiformis, *Staint. Man.* i. 102.

Larva. *Trans. Linn. Soc. ut supra, f.* 3.

Once near High Force, Teesdale.—*Wm. Backhouse, Esq.*

The larva, according to Dr. Staudinger, who has studied the insects of this family most carefully, passes at least two winters in that state in the interior of *Populus nigra* and *P. tremula*, chiefly in the underground portion of the trunks, and in the roots of those trees, feeding on the wood. It forms its coccoon either within the bark, or in the ground adjoining.

2. S. Bembeciformis, *Hüb.*

Sphinx Bembeciformis, *Hüb. Sphin.* 98. Sphinx Crabroniformis, *Lewin, Trans. Linn. Soc.* iii. 1, *pl.* 1, *f.* 6, 7.—*Don. Brit. Ins.* xiii. 7, *pl.* 436.—*Wood Ind. Ent. t.* 4, *f.* 24. Trochilium Crabroniformis, *Steph. Illust. Haust.* i. 138. Trochilium Bembeciformis, *Curt. B. E.* viii. *t.* 372, *f.* * Sphecia Bembeciformis, *Staint. Man.* i. 102.

Larva. *Trans. Linn. Soc. ut supra, f.* 8.

Common throughout the district, and especially so around Newcastle. There is scarcely a willow (*Salix capræa*) of ten years growth in the fences of our suburban gardens, that is not perforated by the larvæ, and ultimately so weakened that the first gale of wind blows it down. In July, the remains of the pupa cases may be observed protruded through the bark in great numbers, though the insects are seldom seen. This species abounded in some willows in a garden at the Westgate some twenty-five years ago, and I was accustomed to surround their trunks with gauze, at the proper season, and so secured the Moths. Twizell.—*P. J. Selby, Esq.* "In Rennie's Lane."—*Ornsby's Durham.*

32. Trochilium, *Scop.*

1. T. Tipuliforme, *Linn.*

Sphinx Tipuliforme, *Linn. S. Nat.* ii. 804.—*Hüb. Sphin.* 49.—*Don. Brit. Ins.* ii. 41, *pl.* 52, 53.—*Wood Ind. Ent. t.* 4, *f.* 32. Ægeria Tipuliformis, *Steph. Illust. Haust.* i. 142. Sesia Tipuliformis, *Staud. Ses. Berol.* 53. Trochilium Tipuliforme, *Staint. Man.* i. 105.

Larva. *Hüb. Gesch. Sphin.* II. *Hymen. B.* 2.—*Don. Brit. Ins. ut supra.*

Probably more abundant with us than expected. Appears generally to affect old gardens, where the red currant bushes (on the medulla of which the larva feeds, passing, according to Dr. Staudinger, one winter in that state) are knarled, and have been long in cultivation. Newcastle. Darlington.—*Wm. Backhouse, Esq.* Common in one garden at Darlington.—*Mr. Sang.*

2. T. Formicæforme, *Esp.*

Sphinx Formicæformis, *Esp. S.* ii. 216, *t.* 32. *Cont.* vii. *f.* 3, 4.—*Lasp. Ses.* 24, *pl. f.* 11, 12.—*Wood Ind. Ent. t.* 4, *f.* 36. Sphinx Nomadæformis, *Hüb. Sphin.* 90. Ægeria Formiciformis, *Steph. Illust. Haust.* i. 144, *pl.* 11, *f.* 3. Sesia Formicæformis, *Staud. Ses. Berol.* 50. Trochilium Formicæforme, *Staint. Man.* i. 106.

Larva. *Hüb. Gesch. Sphin.* II. *Hymen. B.* 3.

Three specimens on an umbelliferous plant near Gibside.—*Mr. Thomas Pigg.*

Dr. Staudinger states that the larva lives over one winter. It is found in the low trunks or branches of *Salix triandra*, and *S. viminalis;* rarely in *S. alba.* When young it lives in the alburnum, but soon enters the wood, and is especially fond of the small side shoots of the stems of these trees.

Of the thirty-six British Sphingina we already number nineteen. Of the remainder, three at least are very doubtful natives of these kingdoms, and several exist only in single cabinets. Three or four additions, such as *Anthrocera Loniceræ*, *Smerinthus Tiliæ*, and *Sphinx Ligustri*, are all we can expect to add to our list, unless some of the birch or alder feeding species of Trochilium should occur in the wilder parts of the counties where these trees are found indigenous.

IX.—*Notes on The Permian System of Northumberland and Durham; being a Supplement to the Catalogue of Fossils of the Permian System of these Counties.* By Richard Howse.*

[Read March 12, 1857.]

Since I had the pleasure in 1848 of drawing up a Catalogue of the fossils of the Permian System, collected by myself in the counties of Durham and Northumberland, at the request and for the use of the Tyneside Naturalists' Field Club, I have on every convenient opportunity been engaged in prosecuting the same studies, both in the cabinet and in the field. The works that have appeared since, by Dr. Geinitz and Mr. King, have also been subjected to a very careful examination. By the assistance of fresh specimens and a careful examination of old and new sections, I am enabled to correct many important inaccuracies which the latter author has made, and also to rectify some of my own earlier statements.

That the distribution of the fossils of this system may be better understood, I have drawn up the following account of the stratigraphical order of these rocks, from notes and sections collected during the last fifteen years. All the most important sections were revisited last autumn, to prevent as far as possible any mistake.

PERMIAN SYSTEM.

1. Lower Bunter?

A deposit of reddish sandstone appears in two or three places in the south-easternmost part of the county of Durham. It is generally so completely covered up with alluvium as to admit of very imperfect examination, and its fossils are entirely unknown.

Loc. Seaton-Carew, Preston-on-Tees, Coatham-Stob.

2. Magnesian Limestone.

Upper.

1. Upper-Yellow-Limestone.—A deposit of yellow, earthy,

* Revised from the Annals and Magazine of Natural History for January, 1857.

friable, thin-bedded limestone, with occasional beds of fine-grained and of oolitic structure.

Probable thickness 100 feet.

Characteristic Fossils.—*Myalina Hausmanni*, Goldf.; *Myoconcha costata*, Brown; *Axinus dubius*, Schloth.; *Littorina helicina*, Schloth.

Loc. Roker, Sunderland Docks, Hartlepool.

2. Botryoidal-Limestone.—This division consists of beds, chiefly of a coralloid, spheroidal, botryoidal, finely-laminated, close-grained, and highly crystalline structure, interstratified with close-bedded, compact layers, and others which are earthy, friable, and pulverulent.

Thickness probably more than 150 feet.

Char. Foss.—*Myalina Hausmanni*, Goldf.; *Myoconcha costata; Axinus dubius*, Schloth.; *Leda speluncaria*, Geinitz; *Littorina helicina*, Schloth. Numerous *Entomostraca* and *Foraminifera*.

Loc. Coast of Durham from Marsden Bay to Roker; patches occur between Hendon and Ryhope, and North and South of Black Halls; Cleadon Hills, Fulwell Hill, Building Hill, &c.

Middle.

3. Cellular and Shell-Limestone.—An amorphous irregular deposit of highly crystalline or saccharine limestone, occasionally full of small, irregular cavities, partially or entirely filled with a fine earthy yellowish powdery substance; other parts present the appearance of being formed of shapeless fragments of compact limestone imbedded in a completely investing matrix, without taking the form of a true breccia. Occasionally, however, large angular masses of finely laminated limestone are imbedded in it, especially towards its highest portion, where it also gradually becomes more earthy, and in some localities regularly bedded, and oolitic. The upper beds are oftentimes strongly undulated and much broken up, and the fissures filled with masses of breccia derived from superincumbent strata.

Its thickness is probably more than 150 feet.

A few specimens of *Axinus dubius*, Schloth.; and traces of *Palæonisci*, &c., have been found in some of the upper regular beds.

Loc. Tynemouth, North Point to the south of Marsden Bay; coast between Ryhope, and Castle Eden Dene; Black Halls; banks of the Wear above Sunderland Bridge; Tunstall Hope.

The Shell-Limestone, forming the westernmost or basseting portion of the above deposit, is an irregular mass of highly crystalline limestone, in some parts exceedingly hard and fine-grained, and in others friable, earthy and rubbly, consisting of broken pieces of coral and shells. It contains an assemblage of the most characteristic fossils of the system. When seen in section it generally rests on the Compact-Limestone, but at Clack's Heugh, it rests also on a bed of friable sandstone.

The thickness, owing perhaps to denudation, is not more than 50 feet.

Char. Foss.—*Terebratula elongata*, Schloth.; *Camarophoria Schlotheimi*, v. Buch; *Spirifer alatus*, Schloth.; *Strophalosia Goldfussi*, Münst.; *Productus horridus*, Sow.; *Fenestella retiformis*, Schloth.; *F. virgulacea*, Phill., &c.

Loc. Down Hill, near West Boldon, Hylton Castle, Southwick Red House, Clack's Heugh, all on the escarpment. High Barns, Humbleton Hill, Elstobs, Tunstall Hill, Ryhope Field House, Dalton-le-dale, Castle Eden Dene. These places are situated on the middle portions of the Magnesian Limestone. At Black Halls it occurs in the form of an interstratified conglomerate. See *Sect. Geol. Trans.*, II. ser., vol. iii., pl. 7, f. 5, D.

Lower.

4. Compact-Limestone and Conglomerate.—In most places on the escarpment the Compact-Limestone forms a very thick deposit of thin-bedded, compact, bluish grey or mottled limestone, becoming occasionally brown, earthy, cellular, and with thicker beds towards the top.

It attains a thickness probably of 150 to 200 feet.

Char. Foss.—Same as in shell-limestone, but not so abundant.

Loc. Whitley, Cullercoats, Tynemouth, outliers; from North Point to Man Haven, surmounted by Cellular-Limestone;

Westoe, West Boldon, Clack's Heugh, Pallion, Mill Field, Humbleton, Tunstall Hope, Painshaw Hill, and most other parts of the escarpment to Pierce Bridge.

The Conglomerate is a very local deposit of rounded fragments of Compact-Limestone imbedded in a limestone matrix. It is of inconsiderable thickness, and passes into the associated Compact-Limestone.

Char. Foss.—Same as in Compact-Limestone.

Loc. Tynemouth.

3. Marl-Slate.

The Marl-slate is a very thin deposit, seldom exceeding a yard in thickness, of a dark grey, or yellowish, finely laminated marl.

Char. Foss.—*Palæonisci*, *Platysomi*, and other fishes; *Discina Koninckı*, Gein.; *Lingula Credneri*, Gein.; *Caulerpites selaginoides*, Schloth., and other fucoids.

Loc. Cullercoats, Tynemouth, Westoe, Down Hill near West Boldon, Clack's Heugh, and most other places on the escarpment.

General Remarks.

The foregoing divisions include all the beds which can be with safety referred to, and satisfactorily determined to belong to the Permian System, as developed in the counties of Durham and Northumberland. But it has hitherto been the custom of English geologists to consider an extensive bed of friable yellow sandstone, and also a bed of red sandstone lying immediately beneath these, as members of the same system, and to separate them by a distinctive name from the subjacent coal-measures, with which they are perfectly conformable, and, so far as the red sandstone is concerned, identical in fossil contents. At Cullercoats and Tynemouth the red sandstone is so evidently conformable to, and passes so gradually into the shales and sandstones of the true coal-measures, that it is impossible to separate them, or point out a line of separation. The same arrangement also is seen on the banks of the Wear, near Clack's Heugh,

where both these beds are seen dipping at the same angle as the coal-measures.

The friable yellow sandstone is present at almost every place along the escarpment of the limestone, but it varies considerably in thickness. It is very coarse and gritty, with strong lines of false bedding; and from its variable thickness within short distances, the superior Magnesian-Limestone must be unconformable to it.

The Red Sandstone, usually pointed out as the equivalent of the German *Rothliegendes*, contains at Tynemouth and other localities an assemblage of genuine coal-measure fossils. During the last summer the following species were obtained from the cuttings made for the new pier at Tynemouth—viz., *Pinites Brandlingi*, *Trigonocarpon Nöggerathi*, *Sigillaria reniformis*, *Lepidodendron*, sp. indet., *Calamites approximatus*, *Calamites inæqualis?*; and in the shale immediately connected with the sandstone, *Neuropteris gigantea*, *Sphenopteris latifolia*, *Cyclopteris dilatata*, &c. The spine of *Gyracanthus formosus* has been found in the same bed near South Shields. In consequence of the presence of so many genuine coal-plants in this bed, its conformity to the coal-measures, and the apparent want of conformity between the friable sandstone and the superior Magnesian-Limestone, we propose that these beds may for the future be considered true coal-measures, and the uppermost members of the Carboniferous System.

In the above divisions, the names given originally by Prof. Sedgwick have been adopted as far as possible. The terms *Pseudo-brecciated*, *Brecciated*, and *Crystalline*, are not admissible as divisional names. The former is the Concretionary or Cellular limestone (Sedgw.), which is a more correct epithet than the proposed new name. The Breccia is too subordinate in the series to require a particular name, and the limestones of the series are all too crystalline to admit of this word as a divisional term.

The following Table will give a pretty correct idea of the distribution of the Molluscan Fauna of the Permian System. The

Brachiopoda are limited to the lower portions of the series—to the Marl-slate, Compact-Limestone, and Shell-Limestone. There is no authenticated instance of the occurrence of a Brachiopod in the breccia or above it. The greatest number of Gasteropods are found in the middle division, the Shell-Limestone. Four species of Conchifera appear to be common to the whole limestone series—viz., *Myoconcha costata*, Brown; *Axinus dubius*, Schloth.; *Myalina Hausmanni*, Goldf.; and *Leda speluncaria*, Gein.

The works principally referred to in the following Table were published at the time mentioned below—viz.,

Geinitz. "Die Versteinerungen," April, 1848.
Howse. "Trans. Tyneside N. F. C., vol. i." Aug. 17th, 1848.
King. "A Cat. of Org. Rem.," Aug. 19th, 1848.
King. "Mon. Perm. Foss.," 1850.

No. of Species.	Genera and Species.	Authors.	References.	Synonyms.	Localities.	Marl-slate.	Magnesian-Limestone. Lower. Compact.	Lower. Conglomerate.	Middle Shell-limestone	Middle Cellular.	Upper. Botryoidal.	Upper. Upper-yellow.	Lower Bunter.
	BRACHIOPODA.												
1	Lingula Credneri ...	Geinitz	Versteinerungen, p. 11, tab. 4. f. 23, 24.	*L. mytiloïdes?* Trans. T. N. F. C. vol. 1. p. 250.	Thrislington Gap, Ferry Hill.	*	*						
2	Discina Koninecki ...	Geinitz	*Orbicula id.* Grundr. d. Verst. p. 495; Verst. tab. 4, f. 25, 26.	*Orbicula*, Trans. T. N. F C. vol. 1. p. 251. *Discina speluncaria*, Mon. pl. 6, figs. 28, 29. *Patella Hollebeni*, Schauroth, Zeitschrift d. deutsch. geol. Ges. 1854. Ta. xxi. f. 8.	Thrislington Gap, Garmundsway, Tunstall Hill, Humbleton Hill.	*	*	...	*				
3	Crania Kirkbyi	Davidson	Mon. Brit. Perm. Brach. p. 49.	.....	Tunstall Hill	...	...	...	*				
4	Productus horridus	Sow. ...	Min. Conch. tab. 319. f. 1.	*Orthothrix excavatus*, Verst. tab. 6. f. 21; *P. Geinitzianus*, De Koninck, Mon. du genre Prod. pl. 15, f. 3; King, Ann. N.H. Ser. 2. vol. xvii. p. 24.	North Point near Shields, Westoe, Hylton Castle, Ryhope Field House, &c.	...	*	*	*				
5	—— latirostratus ...	Howse	Trans. T. N. F. C. vol. i. pp. 256-7; vol. iii. Pl. XI. f. 1, 2;	*P. umbonillatus*, King, Cat. p. 8; Mon. pl. 11. fig. 14-16; Schauroth, Ein Beitrag u. s. w. tab. 1. f. 8-10.	Tunstall Hill, Dalton-le-Dale, Ryhope Field House.	...	...	...	*				
6	StrophalosiaGoldfussi	Münst.	*Spondylus id.*, Beiträge, vol. i. pl. 4. f. 3 *a*, *n*; Davidson, Mon. Brit. Perm. Brach. pl. 3. figs. 1-23. *Orthothrix* Verst. tab. 5. f. 27-30, 32, 34. *Stroph. id.*, Mon. pl. 12. f. 1-12.	*Prod. Morrisianus et P. asperrimus*, Trans. T. N. F. C. vol. 1. p. 257. *Orthothrix excavatus*, Gein. Verst. tab. 5. f. 35-40, tab. 6. f. 20, 23. *Stroph. excavata*, Mon. pl. 12. f. 13-17. *S. Morrisiana*, f. 26? *S. parva*, f. 33. *S. excavata*, var. *Whitleyensis*, King, Ann. N. H. vol. xvii. p. 268. *Prod. Lewisianus*, De Kon. Mon. Prod. p. 262, pl. xv. f. 5 a, b, c, d, e.	Clack's Heugh, Humbleton Hill, Tunstall Hill, Ryhope Field House, Dalton-le-dale, Garmundsway, &c.	...	*	...	*				
7	—— lamellosa.....	Geinitz	Orthothrix lamellosus, Verst. tab. 5, figs. 16-26; Davidson, Mon. Brit. Perm. Brach. pl. 3. f. 24-41.	*O. Goldfussi*, Verst. tab. 5. figs. 31, 33 *a*, *b*, *c*. *Prod. Cancrini*, Verst. tab. 6. figs. 16-19. *Strophalosia Morrisiana*, King, Cat. p. 9; Mon. pl. 12. f. 18-22, 29-32.	Westoe, Clack's Heugh, Humbleton Hill, Tunstall Hill, Ryhope Field House, Dalton-le-dale, &c	...	*	...	*				
8	Streptorhynchus pelargonata	Schloth.	*Terebratulites id.*, Beitr. z. Naturg. d. Verst. p. 28. tab. 9. f. 21-24.	.....	Humbleton Hill, Tunstall Hill, Silksworth, Ryhope Field House, Dalton-le-dale.	...	...	...	*				

No. of Species.	Genera and Species.	Authors.	References.	Synonyms.	Localities.	Marl-slate.	Magnesian-Limestone. Lower. Compact.	Lower. Conglomerate.	Middle. Shell-limestone	Middle. Cellular	Upper. Botryoidal.	Upper. Upper-yellow.	Lower Bunter.
	BRACHIOPODA (*cont.*).												
9	Camarophoria Schlotheimi	v. Buch	über Terebrateln. pl. 2. f. 32.	*Terebratula superstes*, Gein. Verst. tab. 4. f. 51, 52.	Tynemouth, Hylton Castle, Humbleton, Tunstall, Silksworth, Ryhope, Dalton-le-dale.	...	...	*	*				
10	—— globulina	Phill...	Ency. Metrop. vol. iv. pl. 3. f. 3.	*Ter. corymbosa* (errat.), Trans. T. N. F. C. vol. i. p. 253. *T. Schlotheimi*, Schaur. Beitr. pl. 1. f. 3. *a*, *b*.	Tynemouth, Hylton Castle, Dalton-le-dale, &c.	...	...	*	*				
11	—— Humbletonensis	Howse	*Terebratula id.*, Trans. T. N. F. C. vol. i. p. 252; vol. iii. Pl. XI, f. 5, 6.	*C. multiplicata*, King, Cat. p. 7; Mon. pl. 7. f. 26-32, pl. 8, f. 1, 2.	Tynemouth, Humbleton.	...	...	*	*				
12	Spirigera pectinifera	Sow. ...	*Atrypa id*, Min. Conch. vol. vii. pl. 616.	.....	Tynemouth, Hylton Castle, Humbleton Hill, Tunstall Hill.	...	...	*	*				
13	Martinia Clannyana	King...	Cat. p. 8; Mon. pl. 10. f. 11, 12, 13.	*M. Winchiana*, King, Mon. pl. 10. f. 14, 15, 16, 17. Schaur. Beitr. pl. I. f. 27.	Whitley, Pallion near Sunderland, Ryhope Field House, Tunstall.	...	*	...	*				
14	Spiriferina cristata...	Schloth.	*Terebratulites id.*, Beitr. z. Naturg. d. Verst. p. 28. tab. 1. f. 3. Trans. T. N. F. C. vol. iii. Pl. XI. f. 5, 6.	*Trigonotreta undulata*, Schaur. Beitr. pl. I. f. 5; *T. Permiana*, Schauroth, ibid. f. 6.	Humbleton, Tunstall, Ryhope Field House.	...	...	...	*				
15	—— multiplicata ...	Sow. ...	Geol. Tr. 2nd ser. iii. p. 119.	*Trig. Jonesiana*, King, Mon. pl. 8. f. 19.	Humbleton, Tunstall, Silksworth, Ryhope Dalton-le-dale.	...	...	...	*				
16	Spirifer alatus.....	Schloth.	*Spirifer undulatus* Sow. Min. Conch. tab. 562. f. 1.....	*Trig. undulata*, King, Mon. pl. 9, figs 1, 2, 3, 13-17. *T. alata*, id. f. 4-12. *T. Permiana*, id. f. 18-24.	Tynemouth, Humbleton, Tunstall, Midderidge.	...	*	*	*				
17	Terebratula elongata	Schloth.	Beitr. z. Naturg. d. Verst. p. 27. tab. 7. f. 7-14.	*Epithyris sufflata*, King, Mon. pl. 7. f. 1-9.	Tynemouth, Hylton Castle, Clack's Heugh, Humbleton, &c. &c.	...	*	*	*				
	CONCHIFERA.												
18	Pecten pusillus	Schloth.	Beitr. z. Naturg. d. Verst. p. 31. tab. 6. f. 6.	*Pecten Geinitzianus*, De Koninck, Not. sur quelq. Foss. du Spitzberg. Bull. de l'Acad. Roy. des Scien. etc. de Liege, vol. xiii. f. 7. *P. Mackrothi*, Schaur., Zeits. Ges. 1854, tab. 21, f. 1.	Tunstall, Humbleton, Silksworth, Ryhope, Dalton.	...	...	...	*				

19	Lima Permiana	King...	Mon. pl. 13. f. 1.	.....	Tunstall, Ryhope, Humbleton.	...	...	...	*				
20	Monotis speluncaria	Schloth.	*Gryphites id.*, Beitr. z. Naturg. d. Verst. p. 30. tab. 5. f. 1.	*Monotis gryphæoides*, Trans. T. N. F. C. vol. i. p. 249. *M. radialis*, Phill., King, Mon. pl. 13. f. 22, 23. *M. Garforthensis*, id. f. 24. *M.* ——? f. 25. *Avici. Kazanensis*, Gein. Verst. tab. 4. f. 20, 21.	Tynemouth, Clack's Heugh, Hylton Castle, Humbleton, Tunstall, Ryhope, Dalton-le-dale, &c.	...	...	*	*				
21	Gervillia antiqua ...	Münst.	Goldf. Petref. pl. 116. f. 7.....	*Avic. inflata*, Trans. T. N. F. C. vol. i. p. 250. *Bakevellia tumida*, King, Cat. p. 10; Mon. pl. 14. figs. 35, 36, 37. *B. bicarinata*, King, Mon. pl. 14. f. 41, 42.	Whitley, Tynemouth, Clack's Heugh, Hylton Castle, Humbleton, Tunstall, Ryhope, Dalton-le-dale, &c.	...	*	*	*				
22	—— ceratophaga ...	Schloth.	Beitr. z. Naturg. d. Verst. p. 30. tab. 5. f. 2.	*Bakevellia Sedgwickiana*, King, Mon. pl. 14. f. 38, 39, 40.	Humbleton, Tunstall.....	...	...	...	*				
23	Myalina Hausmanni	Goldf.	*Mytilus* id., Goldf. Petref., p. ii. pl. 138. f. 4. Geol. Trans. 2nd ser. iii. p. 120. no. 11. *Myt. acuminatus* Sow. Geol. Trans. 2nd ser. iii. p. 119. no. 10.	*Myt. acuminatus*. Trans. T. N. F. C. vol. i. p. 248. *Myt. Hausmanni*, Gein. Verst. tab. 4. figs. 9-15. *Myt. squamosus*, Trans. T. N. F. C. vol. i. p. 248. *Myt. septifer*, King, Mon. pl. 14. f. 8-13.	Hylton Castle, Clack's Heugh, Humbleton, Tunstall, Silksworth, Ryhope, Dalton, Marsden, Cleadon Hills, Byer's Quarry, Roker, &c. &c.	...	...	...	*	...	*	*	
24	Macrodon striata ...	Schloth.	*Mytulites striatus*. Beitr. z. Naturg. d. Verst. p. 31. tab. 6. f. 3.	*Arca tumida*, Trans. T. N. F. C. vol. i. p. 247; Verst. tab. 4. f. 6 *a*, *b*; Mon. pl. 15. f. 1-5. *A. Loftusiana*, Trans. T. N. F. C. vol. i. p. 246. *A. Kingiana*, p. 247; Verst. p. 9. pl. 4. f. 8 *a*, *b*, *c*. *A. Zerrenneri*, Schaur. Beitr. p. 48, Taf. I. fig. 17. *Byssoarca Kingiana*, Cat. p. 11; Mon. pl. 15. f. 10, 11, 12.	Hylton Castle, Humbleton, Tunstall, Silksworth, Ryhope Field House, Dalton-le-dale.	...	...	...	*				
25	Leda speluncaria ...	Geinitz	*Nucula id.* Verst. p. 9. tab. 4. f. 6 *a b*.	*Leda Vinti*, King, Cat. p. 11; Mon. pl. xv. f. 21, 22. *N. Tateiana*, Mon. p. 175?	Whitley, Humbleton, Byer's Quarry, Tunstall.	...	*	...	*	...	*		
26	Solemya normalis ...	Howse	Trans. T. N. F. C. vol. i. p. 244; vol. iii., Pl. XI. f. 7; Annals, ser. 2. vol. 19, Pl. IV. f. 7.	.....	Humbleton, Tunstall ...	...	...	...	*				
27	—— biarmica	de Vern	Geol. Russ. vol. ii. p. 294. pl. xix. f. 4 a, b. *S. abnormis*, Howse, Trans. T. N. F. C. vol. i., p. 244: Trans. T. N. F. C. vol. iii. Pl. XI. f. 8, 9.	*Panopæa lunulata*, Gein. Verst. pl. 3. f. 21. *S. biarmica*, Gein. Verst. pl. 3. f. 34. *Solemya Phillipsiana*, King, Schaur., Zeits. Ges. 1854, Taf. XXI. f. 5.	Whitley, Humbleton, Tunstall, Silksworth.	...	*	...	*	...	*	*	
28	Axinus dubius	Schloth	*Tellinites id.* Schloth, Beitr. z. Naturg. d Verst. p. 6, f. 4, 5.	*Axinus obscurus*, Sow. Min. Conch. vol. iv. pl. 314. *Schizodus Schlotheimi*, Gein. Verst. tab. 3. f. 23-33; King, Mon. pl. 15. f. 31, 32. *S. truncatus*, King, Cat. p. 11; Mon. pl. 15. f. 25-28. *S. rotundatus*, Brown, King's Mon. pl. 15. f. 30.	Marsden, Cleadon Hills, Roker, Humbleton, Tunstall, Silksworth, Ryhope, Dalton-le-dale, Cornforth.	...	*	...	*				

No. of Species.	Genera and Species.	Authors.	References.	Synonyms.	Localities.	Marl-slate.	Magnesian Limestone. Lower. Compact.	Lower. Conglomerate.	Middle. Shell-limestone	Middle. Cellular.	Upper. Botryoidal.	Upper. Upper-yellow.	Lower Bunter.
	CONCHIFERA (*cont.*).												
29	Astarte Vallisneriana	King...	*Astarte?* Geol. Trans. 2nd ser. iii. p. 119. no. 9; Mon. pl. 16. f. 1.	.....	Whitley	...	*	...	*				
30	—— Tunstallensis ...	King...	Perm. Mon. p. 195, tab. 16. f. 2.	.....	Tunstall Hill								
31	Myoconcha costata...	Brown	*Arca costata*, Manch. Geol. Tr. pl. 6. f. 34, 35.	*Cardita Murchisoni*, Gein. Verst. pl. 6. f. 1-5.	Whitley, Hylton Castle, Clack's Heugh, Humbleton, Tunstall, Silksworth, Ryhope, &c.	...	*	...		...	*	*	
32	Cardiomorpha Pallasi	de Vern	*Modiola id.*, Geol. Russ. vol. ii. tab. 19. f. 16. a—k.	*Cardiomorpha modioliformis*, King, Mon. pl. 14. f. 18—23. *Myoconcha id.* Trans. T. N. F. C. vol. i. p. 245.	Tunstall, Humbleton, Silksworth, Ryhope.	...	...	...	*				
33	Myacites lunulata ...	Keyserling	*Amphidesma id.*, Beobacht, auf einer Reise in das Petschoraland, 1846, p. 258. pl. 10. f. 16.	*Allorisma elegans*, King, Cat. pl. 12; Mon. 16. f. 3, 4, 5. *Solemya biarmica*, King, non Vern., Mon. tab. 16. f. 7.	Tunstall, Humbleton ...	...	...	...	*				
34	Edmondia elongata	Howse	Trans. T. N. F. C. vol. i. p. 243; vol. iii. Pl. XI. f. 10-13;	*Edm. Murchisoniana*, King, Cat. p. 10; Mon. tab. 14. f. 14-17.	Tunstall, Humbleton ...	...	...	...	*				
35	Tellina Dunelmensis	Howse	Trans. T. N. F. C. vol. i. p. 243; vol. iii. Pl. XI. f. 14, 15;	*Psammobia? subpapyracea*, Cat. p. 12; Mon. tab. 16. f. 6.	Humbleton	...	...	...	*				
	GASTEROPODA.												
36	Chiton Loftusianus...	King...	London Geological Journal, vol. i. f. 1-4; Mon. pl. 16. f. 9-14.	.....	Clack's Heugh, Tunstall, Humbleton, Silksworth, Ryhope, Southwick Red House	...	...	...	*				
37	Chiton Howseanus...	Kirkby	Quart. Journ. Geol. Soc. vol. 13. Pl. VII. f. 10, 11, 12, 13.	.....	Tunstall Hill	...	...	...	*				
38	Calyptræa antiqua ...	Howse	Trans. T. N. F. C. i. 242; v. iii. Pl. XI. f. 16 17.	.....	Tunstall Hill	...	...	...	*				
39	Eulima symmetrica..	King...	*Macrocheilus symmetricus*, King, Mon. pl. 16. f. 32, 33.	.....	Tunstall, Humbleton, Silksworth.	...	...	...	*				
40	Chemnitzia Roessleri	Geinitz	*Lox. id.* Geinitz Jahresbericht d. Wetterauischen Gesell. 1850-51; Schaur. Zeits. p. 558, pl. 21. f. 9.	*Chemnitzia* indet., Trans. T. N. F. C. vol. i. p. 241.	Tunstall Hill	...	...	...	*				

41	—— Altenburgensis	Geinitz	*Turbonilla id.*, Gein. Verst, tab. 3. f. 9, 10; Trans. T. N. F. C. vol. 3. Pl. XI. f. 18.	*Loxonema Geinitziana*. King, Mon. p. 210. pl. 16. f. 31. *Lox. fasciata. id.* pl. 16. f. 30. *Turrit. Phillipsii*, Trans. T. N. F. C. vol. i. p. 240. *T. Tunstallensis, id.* vol. I. p. 240.	Tunstall Hill, Humbleton, Dalton-le-Dale.	...	...	...	*				
42	Littorina helicina ...	Schloth.	*Trochilites id.*, Petrefactenkunde, p. 161, 1820; Trans. T. N. F. C. vol. 3. Pl. XI. f. 19, 20.	*Turbo Mancuniensis*, Brown, Manch. Trans. Geol. Soc. vol. i. pl. 6. f. 1-3. 3. *Turbo Taylorianus*, Mon. pl. 16. f. 25, 26. *Lit. Tunstallensis*, Trans. T. N. F. C. vol. i. p. 240. *Turbo Thompsonianus*, King, Mon. 16. f. 23, 24. *Trochus pusillus*, Gein. Verst. pl. 3. f. 15, 16. *Turbo Permianus*, King, Cat. p. 13; Mon. pl. 16. f. 16.	Southwick-lane House, Humbleton, Tunstall, Clack's Heugh. Byer's Quarry near Whitburn, Roker, &c.	...	...	...	*	...	*	*	
43	—— Hercynica	Geinitz	*Nat. Hercynica*, Gein. Verst. pl. 3. f. 11-13.	*Nat. Liebnitziana*, King, Cat. p. 13; Mon. pl. 16. f. 27, 28. *L. minima*, Trans. T. N. F. C. vol. 1. p. 240. *Euomphalus Permianus*, King, Mon. pl. 17. f. 10, 11, 12?	Tunstall, Humbleton, Silksworth, Ryhope.	...	...	...	*				
44	Pleurotomaria antrina	Schloth.	*Troch. id.*, Beitr. z. Naturg. d. Verst. p. 32. t. 7. f. 6; f. 21, 22, 23, 24, 25; Trans. T. N. F. C. vol. 3. Pl. XI. f. 21-25.	*P. Sedgwicki et P. penea*, Trans. T. N. F. C. vol. i. p. 238. *P. Tunstallensis*, Mon. pl. 17. f. 3, 4, 5. *P. Linkiana*, *id.* f. 7, 8.	Tunstall, Hylton Castle, Humbleton, Ryhope, Dalton-le-dale, &c.	...	...	...	*				
45	Pleurotomaria Verneuili	Geinitz	Verst. tab. 3. f. 17, 18.	*P. nodulosa*, King, Mon. p. 216. pl. 17. f. 9. Trans. T. N. F. C. vol. i., p. 238.	Tunstall, Humbleton.....	...	...	...	*				
46	Dentalium Speyeri...	Geinitz	Jahresb. d. Wett. Ges. 1850-51; *Dent. Sorbii.* King, Schaur. Beitr. pl. I. f. 20.	.....	Tunstall Hill.....	...	...	...	*				
	CEPHALOPODA.												
47	Nautilus Frieslebeni	Geinitz	Verstein. tab. 3. f. 7 *a, b, c*; Trans. T. N. F. C. vol. 3. Pl. XI, f. 16, 26.	*N. Bowerbankianus*, King, Mon. p. 220. pl. 17. f. 17, 18, 19. *N. Theobaldi*, Geinitz. Jahresb. d. Wett. Gesell. 1850-51.	Clack's Heugh, Humbleton, Tunstall, Silksworth, Dalton-le-dale.	...	*	...	*				
	PTEROPODA.												
48	Theca Kirkbyi	n. s.	Trans. T. N. F. C. vol. 3. Pl. XI. f. 27.	.....	Tunstall Hill.....	...	...	...	*				

BRACHIOPODA.

1. LINGULA, *Bruguiere.*

1. L. Credneri, *Geinitz.*

The form of this shell as it occurs in the marl-slate of Durham is perfectly oval, the breadth being about two-thirds of the length. On our specimens the roll-formed elevation is not so distinct as Geinitz represents it, but the height of the valve increases from the posterior umbonal margin to about one-third the length of the shell, whence it decreases gradually towards the front, and more rapidly towards the sides. The lines of growth are strongly raised, and much wider apart in front than in any other part.

This shell is finely preserved in the marl-slate at Ferry Hill, where it is rather abundant. The largest specimen I have seen is half-an-inch in length and five-sixteenths in breadth, but it is generally very much less. Only one individual occurred with both valves together, and that was found in the compact-limestone a few feet above the marl-slate. Along with these, numerous fragments of Fishes and specimens of *Caulerpites selaginoides* constantly occur.

I may be allowed to question the occurrence of this or any other species of *Lingula* in the underlying red sandstone, as stated in King's Monograph on the authority of Prof. Johnston, for this sandstone is a true coal-measure stratum.

2. DISCINA, *Lamarck.*

1. D. Koninckı, *Geinitz.*

Very little can be added to the original description of this shell by Geinitz. The German specimens appear to be of about the same size as those occurring in England, and with the same proportions. This Brachiopod has a greater vertical range in England than any of the others, being found in the marl-slate, compact-limestone, and shell-limestone; it is also the rarest.

Geinitz observes, that as "neither the drawing nor description

of Schlotheim's *O. speluncaria* appears to exist, that name should be suppressed." Mr. King has, however, upon Goldfuss's authority, again revived it; but until some figure of it, or some description or specimen can be shown, we have no right to adopt an apocryphal name.

3. CRANIA, *Retzius.*

1. C. Kirkbyi, *Davidson.*

This Crania, recently found by Mr. Kirkby at Tunstall Hill and Humbleton quarries, will be described and figured by Mr. Davidson in the forthcoming part of his work on the British Permian Brachiopoda. The discovery of this Crania is of considerable interest, for though several species of Crania have been found, both in the older and newer formations, until the present the genus was quite unknown in the Permian System.

4. PRODUCTUS, *Sowerby.*

1. P. horridus, *Sowerby.*

The exterior of this shell is now very well known through the numerous figures and descriptions of it which have from time to time been published by several authors, but the interior has up to the present period never been correctly delineated. Through the kindness of Mr. Davidson, I am, however, furnished with four proof-plates of Permian fossils, and favoured with permission to make references to them, in one of which the interior of this species is for the first time faithfully represented.

In the shell-limestone of Humbleton this species generally occurs in casts, on which all the permanent structures of the interior of the shell are faithfully impressed. One can, by a study of these casts alone, restore and represent all the important characters of the interior; but in addition to these casts, one frequently finds at Tunstall the shell itself, showing the interior as perfectly preserved as in recent shells. It is, therefore, rather a matter of surprise that no better figures of the interior of this shell have yet been published. Mr. King figures a gutta-percha cast of the interior of one valve only, and that one, judging from the specimens that I have examined and compared with it, very incorrectly. This will best be proved

by comparing his figure, Perm. Mon. pl. 11, fig. 10, with Mr. Davidson's Mon. Brit. Perm. Brach. pl. 4, figs. 19, 21, and with good casts from Humbleton or interiors from Tunstall. The most incorrect part of Mr. King's restoration is the strongly granulated or obscurely dendritic appearance of the adductor muscular impressions, which are also erroneously divided into two sets; and the reniform impressions are made to take their origin in these more distinctly than is warranted by the appearances of these parts in good specimens. The cardinal-process, the hinge-margin, and the spine-like callosities on the inner surface of the shell are also all very imperfectly represented. The latter, indeed, are represented covering the whole of the cardinal, or, as it may be termed, the ovarian region, which, instead of being studded with spinous callosities, should be minutely pitted. Dr. Geinitz's figures of the same valve are more correct than the one already mentioned, but the adductor muscular impressions are too leaf-like and lobed. All the other figures of this valve that have been published since 1850 appear to be merely copies from King's. It appears rather strange that the interior of the lower valve is neither figured nor described in the Perm. Monograph.

The hinge-line of the upper valve is not quite straight, but slightly angulated, the angle being strongest near the cardinal-process. This cardinal-process or lever varies slightly in form, but is generally bifid at the extremity, each part being again slit by a deep triangular groove or furrow. When *in situ* it fills nearly the whole of the umbonal cavity of the lower valve, and rests against its inner surface. It may thus assist in keeping the valves in position. About the base of the cardinal-process the shell is very much thickened, and from it a strongish ridge runs along on each side parallel to the hinge-margin, which gives to the latter a bevelled appearance. On the outer side of this ridge is seen the row of depressions caused by the cardinal spines. From the base of the cardinal-process a thin plate or septum proceeds straight forwards into the cavity of the shell, becoming deeper and free in front; it separates the adductor muscular impressions and the reniform callosities, to which latter the oral

arms were most probably attached. The muscular impressions on this valve have each a triangular form, and as they are placed close to each side of the median plate, they have together a fan-shaped appearance. They are considerably raised, and most so on the anterior margin. Their surface is sculptured out into deep curved linear hollows for the attachment of the muscles. The surface round about these muscles and the cardinal regions is neatly pitted, causing small pimples on the casts; these are probably the ovarian spaces, and the pittings indicate, according to Mr. A. Hancock's very valuable researches on the Anatomy of the recent Brachiopoda, the points of attachment of small muscles spread over the inner surface of the ovaries to fasten the latter to the shell. One observes similar markings on the corresponding parts of the other valve.

It is generally supposed that the reniform callosities are connected with the vascular system, but this supposition appears to be false, and is unsupported by a comparison of these processes with the corresponding parts of other Brachiopods. If we compare them, for example, with the same valve of *Argiope*, or of *Thecidium*, genera which show points of resemblance to this in several particulars, we find that similar processes have served for the attachment of the oral arms; and this view is supported by all that we know of the position of these arms in both recent and fossil genera. At least, these structures cannot be attributed to the vascular system, or they would undoubtedly be present in both valves, whereas they are confined to one.

On some casts of this *Productus* a great number of small parallel grooves or furrows are seen running from the central ovarian region to the anterior margins of the valves; they are not very distinct, but they may, perhaps, hereafter be found to have been connected with the vascular system. This idea is somewhat strengthened by the appearance of similar lines on some casts of *Spirifer*, which few persons would hesitate to pronounce as vascular sinuses. There remain to be noticed on this small valve the curious spine-like callosities which stud the whole of the anterior portion of the shell; they are strongest where the produced, curved-up portion of the margin takes its

rise, and seem to have been for the more secure attachment of the mantle and for giving it a greater surface.

In the lower valve an elevated callosity near the beak of the shell forms a fulcrum or base for the attachment of the adductor muscles; its surface is strongly rugose. On each side of it are placed the somewhat oblong, finely-striated impressions of the cardinal muscles. The small pittings on the ovarian regions, the spinose callosities, and the grooved surface of the interior, agree with the same appearances in the upper valve.

It is found in England in the compact, and shell-limestone only, in numerous localities.

2. P. LATIROSTRATUS, *Howse.*

When I was engaged in drawing up my Catalogue of Permian Fossils, I found that this shell had not been described or mentioned by any one; and as I had collected several fine specimens at Dalton-le-dale, and had not seen or heard of any other specimens than these, I concluded that it was entirely new, and described it as such in the "Tyneside Transactions" as follows:—

Shell gryphœoid, concavo-convex; lower valve convex, bilobed, or with a slight furrow or sinus in the centre; upper valve slightly concave, or nearly flat; beak of lower or convex valve large, and very much flattened; hinge-line of upper valve rather angulated, furnished with a large triangular button; surface of convex valve covered with a few distant spines.

The above description was drawn up from a cast, Pl. XI., fig. 2, which Mr. Davidson has recently figured, Mon. Brit. Brach., pl. 4, fig. 5, and which Mr. King had the loan of, with all my other Permian *Producti*, for a considerable time. The discovery of a large series of specimens at Tunstall in a fine state of preservation enables me, through the liberality and kindness of Mr. Kirkby, to add a few more particulars to the above description.

The general form is subquadrate, somewhat compressed when seen laterally, but in full-grown specimens it has a considerably produced frontal margin. The lower valve only is covered sparingly with spines of great length; some that I have seen

extend more than two inches from the shell. The hinge-margin of this valve is very much thickened by lines of growth, so as to lead one to suppose that it is furnished with an area, but it is not. A small triangular aperture, open from the very apex, receives the sharply-pointed triangular boss of the upper valve. This sharp point leaves a little narrow groove as the shell increases in growth. But there is no proper area, foramen, or deltidium to be seen—nothing, in short, to warrant its removal from the genus *Productus*.

It differs from *P. horridus* in several important particulars. The cardinal-process, the shape of the muscular impressions, the greater size of the oral arms, the absence of cardinal spines and the flanging of the hinge-margin of the upper valve, are so strongly characterised that it cannot be mistaken for the above or any other species.

Mr. King has given to this shell another name, for the priority of which he refers to his catalogue. As I have stated the claims of priority for my catalogue elsewhere, it may be permitted me to remark here, that this shell is not specifically described in Mr. King's catalogue. It occurs in the shell-limestone only, in which I have taken a fine series at Dalton, and Mr. Kirkby at Tunstall Hill. Herr Schubarth has found it in the equivalent deposit near Pössneck.

5. STROPHALOSIA, *King*.

1. S. Goldfussi, *Münst.*

To this characteristic but variable species I now refer the *Strophalosiæ*, which have been separated into two groups by almost all who have written on Permian shells. I was of this opinion before I became acquainted with Geinitz's "Versteinerungen;" but from the characters given in that work and Mr. King's Monograph, and an excellent series of specimens collected by Mr. Kirkby and myself, I am obliged to abandon this idea, and to include both forms in one specific group.

The *Orthothrix Goldfussi* of Geinitz is considered the typical form. It is the *Strophalosia excavata*, King; and *Stroph. Goldfussi*, King, is without doubt the *O. excavatus*, Geinitz, as

any one may ascertain by consulting the figures and descriptions given by both these authors in the "Versteinerungen" and "Monograph."

Stroph. Goldfussi, Münst., is thus characterised by Geinitz:—"Back (ventral) shell roundish oval, quite like the preceding species (*O. lamellosus*, Gein.), and also without a sinus, and covered all over the surface with close-set tubular spines, and with a short but high area." The shells figured by Mr. King, Mon. tab. 12, figs. 13, 14, 15, 16, so evidently belong to the above description, that I need not quote Geinitz further to prove it. This is the form which I formerly described as *Productus asperrimus*.

Geinitz's *O. excavatus* is described as hemispherical tranverse-oval, with a small, depressed, pointed umbo, a high area, and a narrow, sometimes only weakly-marked sinus, with fine concentric striæ, and studded with thin but long tubular spines. The general character, "halbkugelig quer-oval," is so expressive of the general appearance of King's *S. Goldfussi*, Mon. pl. 12, figs. 1–11, that I cannot doubt its identity with *O. excavatus*.

The principal character by which Geinitz would separate his *O. excavatus* from *O. Goldfussi* is the sinus of the ventral valve. This is not a constant character, and certainly not a specific one. Mr. King observes (Mon. p. 99)—"The arrangement of the spines constitutes a capital distinctive character for this species;" and, strangely enough, he refers to a shell doubtfully referred to *Goldfussi* by Geinitz and excluded from it by King, as a proof. Now, this excluded shell with the "capital distinctive characters" is nothing more than Mr. King's *S. Goldfussi*, for it is the *O. excavatus*, Gein. After all the difficulties attending the study of this species, one turns with pleasure to Mr. Davidson's excellent plate iii., and to the original *diagnosis* of this shell by Mr. N. Winch, in the "Geol. Trans." vol. iv. p. 10, "A species of *Donax* with hair-like spines."

The regular form of this shell, "Mon., Brit. Perm. Brach." pl. 3, figs. 19, 20, 21, 22, ought to be considered as the typical *S. Goldfussi;* and if it be thought desirable to distinguish the other by a varietal name, *excavata* can be applied to it. But

these two forms run so much into one another, that it is impossible to draw a line of separation between them.

This species is common in the shell-limestone of Durham, and occurs also, but more sparingly, in the compact-limestone, and has also a very extensive lateral range.

2. S. LAMELLOSA, *Geinitz.*

In England this shell is best known as King's *S. Morrisiana*, in Germany it is Geinitz's *Orthothrix lamellosus*, and *Stroph. Cancrini*, de Verneuil. Geinitz's specific name must now be adopted, as, thanks to the untiring perseverance of Mr. Davidson, a typical specimen of the genuine *Prod. Cancrini* has been sent to him from Russia, and it has turned out to be a true *Productus*. Geinitz's description and figures of *Orth. lamellosus* were published in the early part of April, 1848, and Mr. King's specific name cannot bear an earlier date than the description given in his catalogue, August 19th, 1848.

This species varies so much with age and locality, and is so apt to become distorted, that no special form can be given that will include all the individuals which undoubtedly belong to it. In general, young individuals are broader than long—that is, when the shell is of regular growth—and the greatest breadth of the shell is then very little more than that of the hinge-margin. In larger individuals the general form is almost circular, and the hinge-margin appears narrower. In distorted specimens the area is much narrower and deeper than in those of regular growth. This is very remarkable in some specimens from Tunstall. At Dalton the specimens are small, and resemble the form to which Geinitz has applied the specific name *lamellosus*. The specimens from Humbleton are much larger, and generally of regular growth. I have never been able to detect spines on the upper valve of any of the specimens from the above localities, but Mr. Kirkby has lately obtained some individuals from Ryhope with the spines distinctly shown on this valve. These specimens are also rather broader than those from other localities, and the striæ are nearly obsolete. The most striking characters common to all these forms are the long

adpressed spines of the lower valve, and the strong radiating striæ which are generally present on both valves. In old individuals the front margin strikes off nearly horizontally, and forms a kind of syphonal tube in front. There is also a tendency in this species to form a new internal surface behind the old upper valve, for the purpose of contracting the interior of the shell. It is not an additional, third valve, as King has absurdly supposed, for it is essentially connected with the upper valve, and must have been formed by the upper lobe of the mantle.

Most plentiful in the shell-limestone of Humbleton, Tunstall, and Dalton. In the compact-limestone it is very rare.

6. STREPTORHYNCHUS, *King*.

1. S. PELARGONATUS, *Schloth*.

This neat species is not included in the list of Permian fossils of the "Geol. Russ." as a British species; and, indeed, when I became acquainted with some of our palæontologists, I found them entirely unacquainted with it. This was remarkably the case with Mr. King, who had not the slightest knowledge of the shell when I first showed it to him, and to whom I presented a fine series of Dalton specimens afterwards, that he might be able to illustrate the species in his "Monograph."

The general form of this species is now, through the figures of Geinitz and King, pretty well known, and the interiors have lately been very accurately represented by Mr. Davidson, in his work on the Permian Brachiopoda, pl. ii. figs. 32–42.

Though a rare species generally, numerous examples are occasionally found in a very limited space. It is the common associate of *P. latirostratus*, both at Dalton-le-dale and Tunstall, where numerous examples have been taken by Mr. Kirkby and myself.

7. CAMAROPHORIA, *King*.

1. C. SCHLOTHEIMI, v. *Buch*.

It is very probable that the specimens figured by Verneuil in "Geol. Russ." under a distinct name, *Terebratula superstes*, belong to the present species; but as I have not seen any of the

Russian specimens, I cannot settle this point. In the "Versteinerungen," pl. 4, figs. 51, 52, Geinitz refers some examples to the *Terebratula superstes*, de Vern., which undoubtedly belong to this species. Mr. King thinks that some specimens figured by Geinitz under the above name, "Verst." pl. 4, figs. 48, 49, belong to another species, but the figures referred to are only more plaited than usual. Similar specimens occur occasionally at Dalton, which also Mr. King is inclined to refer to our *C. Humbletonensis;* but I can say with confidence that this last species never occurs in that locality.

This most characteristic Brachiopod occurs rather plentifully in the shell-limestone of this district, and very sparingly in the compact-limestone.

2. C. GLOBULINA, *Phill.*

This is a very distinct species, though some authors only partially acquainted with it have united it with the preceding.

Its spherical form, constantly biplicated sinus, and the comparative smallness of the size it attains to, would be sufficient alone to separate it from all other Permian species; but in addition to these external characters, the apophysary system is also slightly modified, and it retains its specific appearance in all the numerous localities in which it occurs.

Baron Schauroth has lately figured a German example of it, which he refers to the preceding species. Last summer I had the pleasure of obtaining several good specimens of it from the shell-limestone of Pössneck, where it is not rare.

It occurs in the compact, and shell-limestone, sometimes very plentifully.

3. C. HUMBLETONENSIS, *Howse.* Pl. XI. figs. 3, 4.

"*Shell subtrigonal or obovate; perforated valve with a sinus in the middle, rounded towards the lateral margins; imperforated valve high in the middle, depressed towards the sides; the front margin of the sinus and sides produced horizontally a short distance from the cavity of the shell; surface, with numerous plaits in the sinus, which are sometimes bifurcated, and a few on the sides, granulated.*

This species was first described under the above name in the "Trans. Tyneside Nat. Field Club," where also some other peculiarities are pointed out by which it may be known and distinguished from the preceding species. The testimony of Von Buch in favour of this opinion is singular, for at the same time that he separates *Terebratula Schlotheimi* from the *T. lacunosa*, with which it had been confounded by early authors, he expressly says that the latter is found in the magnesian limestone at Humbleton. It is admitted doubtfully into the list of Permian Fossils in the "Geol. Russ." vol. 1, under the latter name, but none of the specimens from Ilmenau which I have seen are referable to this species.

It occurs in the shell-limestone at Humbleton, sometimes in considerable abundance. I have never found it at Dalton, nor do I think that it occurs there. I have, however, taken one specimen from the magnesian-conglomerate of Tynemouth. It is a very local species, and has not yet been found, I think, in any foreign locality.

8. SPIRIGERA, *d'Orbigny*.

1. S. PECTINIFERA, *Sow.*

The internal structure of this very interesting shell is not correctly represented in King's "Monograph," so far as I am able to judge from specimens collected at Humbleton. In the enlarged figure, tab. 10, fig. 9, the platform, or expansion between the crura of the loop, is much too large, and in fig. 10 the coil is represented with small blunt pectinations round its outer margin. This serrated appearance is due to mineralization, for upon close examination the entire coil of some examples is found to be covered all over with fine crystals. In the greater number of specimens of the interior that I have seen, the coil appeared quite smooth. For the perfect understanding of this species it will be necessary to consult Mr. Davidson's excellent plates, Mon. Brit. Perm. Brach. pl. 1, figs. 50–56 ; pl. 2, figs. 1–5, in which all the peculiarities of this singular shell are carefully represented. I have not, however, up to the present time, been

able to detect the presence of spinous processes on the margin of the coil.

It seems to be generally admitted by English palæontologists, that the generic name Athyris, as applied to this shell, is a serious misnomer; there surely, then, ought to be no hesitation in at once throwing it overboard, especially as according to Mr. Davidson the more correct one is "generally preferred and adopted with good reason on the Continent."

In England this species is almost as limited in its distribution as the last, occurring only in the shell-limestone at Humbleton, Tunstall, and Hylton, and in the magnesian-conglomerate at Tynemouth.

9. MARTINIA, *M'Coy.*

1. M. Clannyana, *King.*

Through the kindness of Baron Schauroth I have lately seen a specimen of this small shell on which the spines were well preserved, from the shell-limestone of Pössneck, but in all the English specimens that I have examined the spines are broken off, and the outer surface of the valves is studded all over with minute granulations.

It occurs rather plentifully at Ryhope-Field-House, and Mr. Kirkby has recently taken it at Tunstall, in shell-limestone. There are some specimens in the Sunderland Museum much larger than any others I have seen; they are from the compact-limestone of Pallion.

10. SPIRIFERINA, *d'Orbigny.*

1. S. cristata, *Schloth.*

It is more sharply triangular than any other Permian species occurring in this district. It is also well characterised by the sharpness and depth of its numerous plaits, and the great size of the perforations of the shell.

It is rather sparingly distributed, occurring mostly at Humbleton and Tunstall in shell-limestone.

2. S. MULTIPLICATA, *Sow.*

It is very much rounded in its general outline, and the plaits are less numerous and more rounded than in the foregoing species. The shell-punctures are very much smaller, so as not to be visible to the naked eye or impressed on casts. The *T. Jonesiana*, King, is only a more rounded form of this shell, occurring commonly at Dalton.

It occurs rather plentifully in the shell-limestone of several localities.

11. SPIRIFER, *Sowerby.*

1. S. ALATUS, *Schloth.*

I regret that I cannot assent to the division of this fine characteristic shell into three species, as proposed by Mr King in the "Permian Monograph." The specimens figured in that work, pl. 10, are all referable to the above, and in the text no character has been pointed out of specific or even varietal value.

It is not very abundant in any locality, but may be met with most frequently at Humbleton in the shell-limestone. It occurs also in the compact-limestone and in the magnesian-conglomerate at Tynemouth.

12. TEREBRATULA, *Llhwyd.*

1. T. ELONGATA, *Schloth.*

I agree fully with Dr Geinitz, who has referred all the forms, including *T. sufflata*, occurring in the magnesian limestone, back to this species; and I deeply regret that the author of the "Permian Monograph" has again attempted to raise the *T. sufflata* to the rank of a species, for surely nothing can be so injurious to the true progress of science as the burdening of it with false species and useless synonyms.

This species is very abundant in several localities in the shell-limestone, of which it is very characteristic. It occurs at Tynemouth, in the magnesian-conglomerate.

CONCHIFERA.

13. PECTEN, *O. F. Müller.*

1. P. PUSILLUS, *Schloth.*

The author of the "Perm. Monog." has, in translating Goldfuss's specific description of this little shell into his "Monograph" and into English, made a little too free with the Latin original. In the "Monog.," "antica valvæ dextræ majori subplicata," is rendered "the fore part of the right valve in a great degree subplicate." Now this is both contrary to fact and to Goldfuss's German description, as well as to the Latin, and might lead to a little confusion hereafter.

This Pecten is described as smooth by all authors, and such is its most general appearance; but when the shell is perfect and well preserved, there are to be seen all over its outer surface fine striæ of growth running parallel to the lower margin. Also on many specimens numerous fine lines radiate from the umbones to the same margin. The hinge-line is furnished in some individuals with an area of comparatively great size, but generally it is so small as not to be observable.

Some specimens of a Pecten which are found in a peculiar yellow conglomerate near Gera in Germany have lately been elevated into a species by Baron Schauroth, under the name of *Pecten Macrothi.* I have examined some fragments of this shell obligingly sent to me by this learned Permian palæontologist, and I am sorry that I am obliged to consider the distinguishing character which he has pointed out as not of sufficient value to constitute a species. The chief character mentioned as peculiar to this new shell is the distant, very flat lines of growth parallel to the margin. But this is, as above stated, the perfect appearance of the surface of *Pecten pusillus*, to which the *Pecten Macrothi*, I have no doubt, belongs. To this, also, must one refer De Koninck's *Pecten Geinitzianus*, from the Spitzbergen Permian rocks.

This species occurs most abundantly in the shell-limestone of Humbleton, and sparingly in all the other localities mentioned

in the Table. It is also stated in the "Perm. Mon." to occur in the compact-limestone at Whitley and Tynemouth.

14. LIMA, *Bruguière.*

1. L. Permiana, *King.*

Though I had taken single valves of this shell many years ago, yet the slight distinguishing characters it presented have always prevented me from considering it distinct from the preceding. But Mr. Kirby has, with his usual success, obtained such a fine series of it from the places mentioned in the Table, that its admission into the fauna can be no longer objected to. It has also been discovered by Baron Schauroth at Poessneck; and some examples kindly sent me for comparison agree with ours in every particular.

It differs from the preceding chiefly in the obliquity of the valves, in the narrowness of the hinge-line, and the more triangular appearance of the area. It has also no byssal notch. The surface, in perfect specimens, is ornamented with fine parallel lines of growth, and small radiate depressions run from the umbones to the margin. For the present, it may be left in the genus *Lima*, but this requires further examination.

In the shell-limestone of Tunstall and other localities; not very common.

15. MONOTIS, *Brown.*

1. M. spelungaria, *Schloth.*

Certainly no one at all conversant with this pre-eminently characteristic Permian bivalve, can assent to its being unnecessarily broken up into three species, as proposed by the author of the "Perm. Mon."

As pointed out in the "Tyneside Catalogue," the convex valve when perfect exhibits "a few strong imbricated or granulated diverging ribs, between which there are others much finer and closer together." The granulations are strongest on one side of the valve, and occur only on those specimens that are of very regular growth. On the coarser and larger individuals the ribs are covered with strong imbricating processes, which are

oftentimes considerably produced. These characters correspond with those given by Dr. Geinitz in his "Versteinerungen," but *Avicula Kasanensis*, Geinitz, can only be reckoned a coarser variety of this species.

It is not common in the compact-limestone, but sometimes occurs very plentifully in the shell-limestone of Humbleton and other localities. In the higher deposits it has never been known to occur.

16. GERVILLIA, *Defrance.*

1. G. ANTIQUA, *Münst.*

At present I am unable to decide whether the above name ought to be retained for this species, as the figures given by Goldfuss are not very good representations of it, and are referred by Dr. Geinitz to the following, *G. ceratophaga*. Many other eminent naturalists also are of opinion that *antiqua* is only a variety of the latter; but I am not at liberty to adopt this opinion.

It is altogether a very much broader and a more inflated shell than the following species. The posterior margin is never so much arcuated or forked, and the wings are never so strongly and distinctly marked off from the body of the shell as they are in *G. ceratophaga*. The cartilage-pits, generally three or four in number, are, from increasing in width with the growth of the hinge-margin, rather triangular, and are placed directly across the area. They are never oblique in the specimens I have examined, as represented in the "Perm. Mon.," and the first pit invariably stretches directly between the umbones. In the clumsily-grown *tumida*, which is only a stunted form of this species, they are placed closer together and are more numerous, though the hinge-line is much shorter. The *Bakevellia carinata*, King, is only the young of the present species, which has oftentimes two strong, raised, diverging lines running from the umbones to each side of the byssal notch.

Through the kindness of Mr. Binney I have made the following notes on Capt. Brown's species of *Avicula* from the Lancashire Permian deposits:—

"The three specimens of *Avicula Binneyi* belong undoubtedly

to the *A. antiqua* of the Durham magnesian limestone. *A. inflata* is identical with the preceding. The hinge-area is very much inclined, perhaps from the valves being partially open. The only difference perceivable in *A. discors* is that the area is not so much developed, and the umbones are closer in consequence. The right valve also appears smaller than usual, but this may be from compression. Two other specimens of *A. antiqua* in the same collection were much larger and better preserved than the preceding. They have the posterior margin also more forked, and there is a deepish constriction running from the umbones to the ventral margin."

Great development of the hinge-area cannot be considered a specific character in this species, nor in some of the following; for when this area is greatly increased, there is generally a very stunted growth of some other part of the shell.

This species and the following may be very safely and most conveniently placed in the above genus, "until more is known of the general characters and chronogeny of a number of palæozoic fossils." There seems to be no necessity for instituting a new one for their reception at present.

In the compact-limestone rare, but rather plentiful in some localities in the shell-limestone. In this district it has not yet been detected in the higher members of the limestone, which are probably the true equivalents of the Permian marls of Manchester and its neighbourhood, where this little shell seems to be very common.

2. G. CERATOPHAGA, *Schloth.*

It is of a more elegant form than the preceding, and the tumid part of the shell is more distinctly characterised and produced to a greater length posteriorly than in the *G. antiqua.* The hinge-line is very long, and produced posteriorly to a fine point, whence it curves beautifully downwards, forming a deep curve with the tumid part of the shell. The hinge-area is not so broad and more parallel than in the foregoing species; and its cartilage-pits, placed directly across, and not obliquely, as described in the "Monograph," have an oblong appear-

ance. The first pit is placed immediately between the umbones, and only in one instance have I seen more than three, though it is stated by Mr. King that there are sometimes six. This species is very imperfectly represented in the "Perm. Mon.," for not one of the figures gives a correct idea of the perfect appearance of this shell; and the cartilage pits are represented as being oblique, which is quite contrary to what I have always observed. The *Bakevellia Sedgwickiana* cannot be considered even as a variety of this species. The surface of *G. antiqua* and *ceratophaga* is, when perfect, covered with beautiful, raised, distant lines; and this is the commonest style of shell-ornament that occurs in the Permian rocks.

It is rather common in the shell-limestone of several localities.

17. MYALINA, *Koninck.*

1. M. Hausmanni, *Goldfuss.*

It seems advisable to adopt the specific name given to this shell by Goldfuss, as it is the first that is accompanied with a good description and figure. It has been mentioned, under another name, in a few English works, but we have no accurate or admissible description of it, and no figure that I am acquainted with that can claim earlier date than those in the "Perm. Mon." The above is a well-established name on the continent, and has been so for very many years.

It is not possible any longer to separate this common shell into two species, for there is no character by which they can be distinguished specifically. The examples that occur in the lower and middle beds of limestone are narrower, and appear more elongated than those which occur in the upper deposits. The latter are generally broader and more ovate in form, but in all essentials they are alike. They have all occasionally the ligamental area very much produced; but this is not a specific character, for individuals often occur with a narrow hinge-line. The squamose appearance of these shells is not the true outer surface, for the latter is most beautifully adorned with very fine and regular lines of growth. It is only in finely-preserved spe-

cimens from the upper beds that this character is shown to perfection, but it may be traced on very many specimens from the shell-limestone.

The existence of this mytiliform shell in such great plenty in the shell-limestone, and its generally rough and stunted appearance, would seem to lead to any other than the conclusion that this deposit of shell-limestone was of "*pelagic*" origin. The entire fauna of this limestone is indeed so decidedly littoral in character, and so clearly of shallow-water origin, that I could not, many years ago, refrain from pointing it out, and no statement has been made since that invalidates this conclusion.

This species is most abundant in the shell-limestone, and occurs sparingly in many of the upper beds of limestone.

18. MACRODON, *Lycett.*

1. M. STRIATA, *Schloth.*

The form of the teeth of this shell agrees with that of *Macrodon*, Lycett, and Morris, and the general shape is also very similar. The hinge-area is often very much developed in specimens whose growth is somewhat stunted round the free margins of the shell. This is the form best known in England, (*Arca tumida*, Sow.) The regularly-grown shell is one of the most beautiful, both in form and ornament, of those from the Permian rocks. The smooth or partially smooth examples described as a species (*A. Kingiana*), can often be traced on the umbonal regions of genuine *M. striata.* The specimens figured in the "Perm. Mon." give a very poor idea of the shape and beauty of ornamentation of this common characteristic species.

In the shell-limestone, rather common at Tunstall, and occurring frequently in all the localities mentioned in the Table. It appears to be a much commoner species in England than in Germany.

19 LEDA, *Schumacher.*

1. L. SPELUNCARIA, *Geinitz.*

It is not to be disputed that Geinitz's figure and short description of this little shell have priority over Mr. King's;

therefore I feel no hesitation in adopting it, although it is placed among the synonyms in the "Perm. Monograph." It occurs rather sparingly in the upper beds of limestone, and more rarely in the shell, and compact-limestone.

The *Nucula Tateiana*, King, is mentioned here that it may not be lost sight of. It is impossible to adopt it as an authenticated species, for, according to Mr. King's own words, the description is drawn up from "the dorsal half" of a specimen only. Baron Schauroth has favoured me with some specimens of a true Permian *Nucula (N. Beyrichii)* from the zechstein of Germany; and this renders it very likely that on some future occasion specimens of a true Nucula may occur in our limestone.

20. SOLEMYA, *Lamarck.*

1. S. NORMALIS, *Howse.* Pl. XI. fig. 7.*

"*Shell transversely oval, narrow, slightly arcuated; beaks indistinct near the posterior end; anterior (much) elongated; muscular impressions large, slight; a few raised lines diverging from the beaks to the free margins on the cast; external surface smooth.*"

I obtained a single left-valve of this very rare shell on a block of Humbleton Hill shell-limestone, on Good Friday, 1845. I afterwards described it, in the above words, in the "Tyneside Catalogue." It was there pointed out, that though it bears a slight resemblance to *S. biarmica*, yet the beak is nearer the posterior end, and the shell is much narrower than in the Russian species. The anterior is also more elongated, and the surface is quite smooth. It is also very much smaller. All these differences are borne out by two other left-valves lately found by Mr. Kirkby at Tunstall.

Mr. King had the loan of the above specimen for several months; and I find he has not only recorded his discovery of the specimen in my cabinet!! (*London Geol. Journ.*, vol. i., p. 10,) but has also, in the "Perm. Monog.," attempted to describe and to figure a species which he identifies with this. But he has succeeded very badly, both in the description and in the figure, which does

* The figure in the accompanying plate does not represent the rounded appearance of the anterior extremity as correctly as could be desired.

not represent mine or any other species. Baron Schauroth, in one of his excellent papers, identifies a German specimen with Mr. King's description and figure; but he found so little character in the latter, that he was obliged to leave the matter in doubt. Certainly the *S. Phillipsiana*, King, is not worthy to be considered even a synonym.

Two or three left-valves have been found in the shell-limestone of Tunstall and Humbleton.

2. S. BIARMICA, *De Verneuil?* Pl. XI. figs. 8, 9.

"*Shell transversely oval; beaks not prominent; posterior short, narrow, rounded; anterior elongated, rounded, much wider than the posterior; surface slightly waved concentrically, plain; muscular impressions obliquely placed, deep.*"

This species is very pointed posteriorly, and the anterior is much produced and very broad. It is also much flattened, and all the specimens I have examined are quite smooth. The German casts are rather tumid, slightly arcuated, and have the valves rounded and covered with strong lines of growth near the anterior margin. It is, therefore, still very doubtful whether all the shells placed as synonyms in the Table are correct.

I find that this shell is known in Germany under the above epithet, and have in consequence adopted it. But Russian specimens must be examined before this identification can be positively determined.

It remains to be stated that Mr. King also identifies this species with the *S. biarmica;* but the figure given in the "Perm. Mon.," pl. 16, fig. 7, represents no *Solemya*, but a young specimen of the *Myacites lunulata.*

I have taken specimens of the above shell at Whitley, in the compact-limestone; at Tunstall and Silksworth, in the shell-limestone; and Mr. Kirkby has recently obtained a specimen from Humbleton.

21. AXINUS, *Sowerby.*

1. A. DUBIUS, *Schloth.*

Baron Schauroth has recently shown that the specific name

dubius, originally applied to this shell by Schlotheim, has priority of all others, even of the now well-known Sowerbian epithet *obscurus*. It is therefore necessary to adopt this so-long-neglected name.

Under this name there may be very conveniently placed the following species of authors:—*Axinus obscurus*, Sow.; *A. parvus*, *pusillus*, *productus*, *undatus*, *elongatus*, *rotundatus*, and *Lucina minima*, Brown; *Schizodus Schlotheimi*, Geinitz, and *Schizodus truncatus*, King.

Remarks on Mr. Binney's Specimens.—Two small casts of *Ax. parvus* belong without doubt to the above.—*A. productus* resembles the form which King has separated under the specific name *truncatus*. It is rather more produced in front, and more truncated behind. It cannot claim to be more than a regular growth of *dubius*.—*A. undatus* and *A. elongatus* belong also to the above. They present no peculiar characters. *A. pusillus* and *Lucina minima* appear to be the young of the foregoing species.

In the "Perm. Mon.," under four specific names (pl. 15. f. 23-32), are very good representations of some of the forms of this characteristic species; but the peculiar ornament of the shells of this genus is, I think, not represented.

In the upper beds of limestone it occurs of great size, some specimens being two inches in length. It is rather scarce in the shell-limestone, and rare in the compact.

22. ASTARTE ? *Sowerby.*

1. A.? Vallisneriana, *King.*

The specimens of this shell which I have collected at Whitley are rather more triangular than the figure in the "Perm. Mon.," and very much resemble, both in the general form and ornament of the valves, some young specimens of the recent *Venus striatula*. The hinge-line is furnished with a deep triangular cartilage-pit, and the character of the superficial ornament is preserved on the casts.

The *Astarte Vallisneriana* occurs in this district in the com-

pact-limestone only; and, according to Baron Schauroth, it is found in the equivalent deposit near Gera in Germany.

2. A.? Tunstallensis, *King*.

Six or seven specimens of a little subtriangular shell, which Mr. Kirkby has recently taken, are referred to the above species, as it is very probable that they belong to the species intended to be described by Mr. King under that name. But only a reference to the type-specimen, of which it is to be hoped due care has been taken, can substantiate this identification. For supposthem to be the same, the "diagnosis" in the "Perm. Monog." is very incorrect, and the figure, pl. 16 of that work, represents the shell as being almost flat. The specimens now before me have a very swollen or tumid appearance, and are subtriangular in marginal outline. They are retained in the genus *Astarte* with considerable doubt.

In the shell-limestone, Tunstall Hill.

23. MYOCONCHA, *J. Sowerby*.

1. M. costata, *Brown*.

I find nothing in the form of the teeth of this shell that requires it to be removed from the genus *Myoconcha*. So far as I have been able to ascertain, there is only one oblique cardinal tooth in the right valve, which fits into a corresponding depression of the left.

The examples from this district agree very accurately with the original specimens described by Capt. Brown. In general, all the specimens are strongly marked with several oblique radiating ribs or planes over the posterior surface. Some specimens occur at Byer's Quarry quite smooth, and more ovate than usual. These have, I see, been prospectively named *Pleurophorus ovatus* in the "Perm. Mon." They do not appear to differ specifically from the foregoing.

It ranges through all the limestone series, but is most plentiful in the shell-limestone of Tunstall and Humbleton.

24. CARDIOMORPHA, *Koninck.*

1. C. Pallasi, *De Verneuil.*

It has been proposed by Baron Schauroth to unite this species with the *Modiola Pallasi*, De Vern., and after examining some German specimens with which he has kindly favoured me, and ascertaining from some of Mr. Kirkby's specimens that the hinge is really toothless, I fully agree with this identification.

Baron Schauroth has placed it in the genus *Cleidophorus*, Hall; but Mr. King has, I think, more correctly referred it to *Cardiomorpha*, De Koninck.

In one of Mr Kirkby's specimens, the ligament, which is finely preserved, is comparatively large. Some specimens of the same shell from the equivalent deposit of Pössneck have the ligament in a fine state of preservation.

It is found in the shell-limestone only, where, sometimes associated with its congener, *M. costata*, it is rather plentiful.

25. MYACITES, *Schlotheim.*

1. M. lunulata, *Keyserling, sp.*

"Schlotheim's name, *Myacites*" (writes Mr. King, "Perm. Mon." p. 196), "implies that the shells so called are fossil Myas: as this is not the case, the name cannot stand." And just above this note the same author states, that "the name (*Allorisma*) was proposed under the persuasion that the cartilage-fulcra of the genus varied in position according to the species. This is now known to be an error; the name is, however, still retained, notwithstanding its being a misnomer." The conclusiveness of this reasoning seems to have had its effect upon all careful English naturalists, for I find *Myacites* now adopted, and *Allorisma* consigned to mere oblivion. It still, however, lingers on the Continent, shortly to become for ever extinct.

There can be little doubt about the identity of King's *A. elegans* and the *Amphidesma lunulata*, Keyserling. Even Mr King himself seems disposed to admit this. This being so, the latter name for the species must be adopted, because the three

first references in the "Perm. Monog." are only base, catalogue names, without either figure or description, and as such have no right of priority. If due attention had been paid to this rule, most of the flagrant errors which now disfigure the "Perm. Monog." would have been avoided.

The specimen which Mr. King has figured as *Solemya biarmica*, De Verneuil, Perm. Mon. pl. 16, fig. 7, is only a young specimen of *lunulata*. This species belongs to the genus *Myacites*, as restricted by Morris and Lycett.

It occurs very sparingly in the shell-limestone of Tunstall and Humbleton.

26. EDMONDIA, *Koninck.*

1. E. ELONGATA, *Howse.* Pl. XI. figs. 10, 11, 12, 13.

"*Shell elongated oval; beaks prominent, near the anterior end; anterior short and rounded; posterior elongated, the dorsal margin on a line with the beak; surface convex, covered with strong concentric lines of growth; hinge without teeth; umbonal cavity divided longitudinally by an elongated, thin, slightly curved visceral plate, depending towards the cavity of the shell.*"

The above is the original description of this shell given in "Tyneside Catalogue," vol. I. It points out one peculiarity of this species and genus, which appears to be generally misunderstood by authors:—The shelly process situated in the umbonal cavity is supposed to be a cartilage-plate, and to belong to the hinge. In Mr. Woodward's excellent Manual, it is suggested, with doubt, that the shells of this genus were furnished with an ossicle. An examination of several cross-sections of shells belonging to this genus does not appear to substantiate this conclusion. The shell, also, of most of the species is very thin, and the valves are united by a strong external ligament, as a Permian specimen from Germany, and some examples of the carboniferous *E. arcuata* in my possession clearly show. It could not, therefore, require an internal cartilage of such a size. But these are, I think, not cartilage-plates, but internal processes equivalent to the subumbonal or spatula-shaped blade of the genus *Pholas*,

which projects into the cavity of the shell, and forms an advanced point of attachment for a visceral, or perhaps for the pedal muscle. The general configuration of this shell also suggests that it was a burrowing mollusk. It is very doubtful whether this species belongs to the genus *Edmondia*, De Koninck.

It is not a very common species in the shell-limestone of Tunstall, Humbleton, &c., and occurs also in the equivalent deposit of Pössneck.

27. TELLINA, *Linn.*

1. T. Dunelmensis, *Howse.* Pl. XI. figs. 14, 15.

"*Shell elliptical; beaks small, not prominent, situated near the anterior end, which is somewhat rounded; posterior elongated, more acute than the anterior; two cardinal teeth in each valve.*"

The specimens of the shells which I have been able to examine do not permit much to be added to the above characters. The specimen figured in the "Perm. Mon." is imperfect, for the posterior of this shell is rather acute, perhaps not quite so much so as in the figures, Pl. XI. figs. 14, 15. The valves are generally found together, and spread out, which is the case also with several other Permian species. It shows that they were provided with a very strong ligament.

In the shell-limestone at Humbleton.

GASTEROPODA.

28. CHITON, *Linn.*

1. C. Loftusianus, *King.*

The general form of this Chiton, and the size it attained to, are at present unknown, for the plates have never been found articulated together. It may, perhaps, be inferred, from the size of the plates that have occurred, that it was rather a small species than otherwise.

The marginal outline of the first and last plates is semicircular, that which I suppose to be the second is rather unguiform. The third plate, supposed by the author of the "Perm. Mon." to be the second, is somewhat triangular; the fourth is slightly furcated;

and the other three, assuming it had eight altogether, are oblong or strap-shaped in marginal outline. The second, third, and fourth plates are broad and very oblique; the fifth, sixth, and seventh, narrow and transverse. The posterior plate, which is not "*capuliform*," but half-limpet-shaped, has its apex or mucro produced to a fine point. Seen in profile, all the plates, excepting the first or head-plate, are curved towards the posterior margin, considerably elevated along the dorsal line, and pressed down steeply on each side towards the lateral margin. The lateral areas of the intermediate valves, excepting the second, are large and distinctly defined. Occasionally a small sulcation or furrow may be seen on each side of the dorsal ridge, but this seems to be rather an accidental than a specific character. The entire surface of all the plates is minutely granulated or shagreened, and the striæ of growth are very distinct on the dorsal as well as on the lateral areas. The interior of the valves is minutely pitted or granulated. The apophyses or processes of attachment of the mantle are large, nearly semicircular, and, as they are confined to the lower half of the dorsal area on each side, they are consequently very widely separated. It, perhaps, may be inferred, from the disparity in the shape and size of the plates, that this Chiton was much narrower in front than behind; and from the greater comparative length of the anterior plates, it closely approaches some of the recent spinose species, such as *C. spinulosus*.

This Chiton is neither exactly described nor correctly figured in the "Perm. Monograph," for if the "*diagnosis*" given by Mr. King be correct, several species might be made from the valves that are found at Tunstall. After examining the plates of this Chiton, especially the posterior one, I am inclined to think that the shells included in the genus *Metoptoma* will prove to belong to the *Chitonidæ*.

Peculiar to the shell-limestone of the North of England, in which, though not plentiful, it is very generally distributed.

2. C. Howseanus, *Kirkby*.

Of this very distinct species Mr. Kirkby has now taken an almost perfect series of plates, and as the original description of

some of these will follow in the next paper, it is only necessary to refer to it for a well-characterised description of the species.

Found in the shell-limestone, Tunstall Hill.

29. CALYPTRÆA, *Lam.*

1. C. ANTIQUA, *Howse.* Pl. XI. figs. 16, 17.

In 1847 I found a single imperfect specimen of a patelliform shell at Tunstall Hill, which was described thus in the "Tyneside Catalogue:"—

"*Shell small, patelliform, strongly ribbed longitudinally; margin crenulated; two deep furrows internally from the apex to the margin, corresponding with two strong ribs on the outer surface.*"

The only specimen found was not quite perfect round the margin, and the whole shell had the appearance of being irregularly grown. It was thought, however, desirable to include it in the Permian list, and to affix an epithet to it, for the sake of reference. Mr. King, not being acquainted with it, and consequently considering it a "doubtful species," placed it in the Appendix to the "Permian Monograph" (p. 247). Mr. Kirkby has, however, lately with his usual success detected three more specimens, two of which were found in the same part of the quarry in which the original specimen was discovered. Mr. King may also assure himself that it is not a "doubtful species," by examining the type-specimen in the Museum of the Geological Survey, Jermyn Street, London. In the first draught of this paper, I too hastily identified the *Patella Hollebeni*, Schauroth, with this species, but since that time I have examined a clay-cast of that supposed species, and I think that it represents only a distorted or compressed Discina.

The only known examples are from the shell-limestone, Tunstall Hill.

30. EULIMA, *Risso.*

1. E. SYMMETRICA, *King.*

In the "diagnosis" given by Mr. King, the general form of this shell is incorrectly stated to be "*fusiform.*" There is no fusiform shell in the Permian system that I am acquainted with,

and Mr. King's own figures do not represent it as such. More correctly, the general form is subulate, as the front portion of the mouth is much the broadest part of it. The surface appears to be smooth. The spire is produced to a fine point, and the very oblique suture is closely pressed in, and is not folded over, as in those shells which are generally referred to the vague genus *Macrocheilus*. Some specimens show broad bands of colour arranged as on some of the recent *Eulimæ*.

The meagre description of this good species, and the unsatisfactory figures of the "Perm. Mon.," have led Baron Schauroth to suppose that it may belong to one of the following species; but the general form of the shell is too characteristic to allow of this conclusion being permanently entertained. It attains sometimes to more than an inch in length.

In the shell-limestone of Tunstall, not very common; also in the same deposit at Humbleton and Silksworth. It does not appear to have yet been found in Germany.

31. CHEMNITZIA, *D'Orbigny*.

1. C. Roessleri, *Geinitz*.

In the "Tyneside Catalogue" I gave the first account of a fragment of a plicated shell, which evidently belongs to the above, in the following words:—

"Chemnitzia.—We procured a fragment of a small shell from Tunstall Hill, which possesses more of the characters of this genus than of any other we are acquainted with. It has a few gradually-increased whorls, which are very convex and deeply fluted. The suture is deep, and the pillar straight. This may be the shell included in the tabular list of the 'Geology of Russia' as *Loxonema rugifera*. It cannot, however, be referred to that species, nor to the genus *Loxonema*, as the suture is deep, and not pressed against the former whorl, as in that genus. It is also destitute of striæ."

In King's "Cat. Org. Remains of Permian Rocks," published two days after the above, I find no shell described or referred to that can be identified with the *C. Roessleri*.

In the "Perm Mon.," however, the *Chemnitzia* noticed above

is affixed to a long train of names of *Loxonema rugifera*, and a new specific name, as it is called, is very quietly appended, and a "diagnosis" substituted, which would apply to a great number of species of a great many genera; and, in the remarks, an admission is made that "imperfect specimens, about an inch in length, of a species resembling *Loxonema rugifera*, Phillips, have twice occurred to me; but through some accident, they have been mislaid." Now, unless these "missing specimens" have since been found, there does not exist a type-specimen of *Loxonema Swedenborgiana*, King, according to this author's own statement; and why then should palæontology, grievously overburdened already, be pestered with another unauthenticated name?

As Mr. King's "diagnosis" and remarks do not apply to my shell, I prefer adopting the one proposed by Dr. Geinitz, especially as the same shell has been further mentioned and figured by Baron Schauroth (Zeitschr. d. deutschen Gesellschaft Jahrg. 1854, s. 558. taf. 21. fig. 9). But, in his last work, Baron Schauroth has given a preference to King's name without assigning any reason for the change, and he also seems inclined to think that it is only a variety of the following species.

It is more turreted than the *C. Altenburgensis*, and the plications do not appear to be accidental, but permanent and of specific value. Specimens that have occurred are about half an inch in length.

Collected in the shell-limestone of Tunstall and Humbleton by Mr. Kirkby and myself, and in Germany it is mentioned by Dr. Geinitz and Baron Schauroth.

2. C. Altenburgensis, *Geinitz, sp.* Pl. XI. fig. 18.

It seems to be necessary to trace the history of the discovery of this little shell, which has been described within the last ten years under five or six different names, in order to establish the epithet adopted above for this species.

It is, I believe, first mentioned, in the following words, in Prof. Sedgwick's paper on the "Magnesian Limestone, &c. of the North of England," Geol. Trans. 2nd ser. vol. iii. p. 118:—

"To this list may be added (five *errat.*) a species of *Melaniæ?* less than half an inch long, with eight whorls; Hawthorne Hive. (MS. Catalogue by Mr. J. Phillips.)" No specific name is applied to it.

The next mention of it (unless the *Turritella biarmica*, Kutorga, and the *Murchisonia subangulata*, Vern., be the same species), and the first accompanied with a short description, figure, and specific name, is by Dr. Geinitz in the "Versteinerungen des deutsch. Zechsteingebirges," p. 7, tab. 3, figs. 9, 10. The short description is in the following words:—

Turbonilla Altenburgensis, "a little tower-shaped snail, with six or more rounded, smooth whorls," &c.

Next, in the "Tyneside Catalogue," p. 240, it is thus characterised:—

"Turritella Phillipsii, n. s. *Shell elongated, narrow, slightly tapering, turreted; spire with twelve or more rounded whorls, which are rather convex and slightly flattened behind; suture deep; pillar-lip slightly angulated in front; aperture suborbicular.*" And "T. Tunstallensis. *Shell elongated conical; spire with eight whorls, which are much rounded, smooth; suture deep; aperture orbicular.*"

Notwithstanding the differences pointed out, after examining a large series of specimens, I am now of opinion that the latter shell is only a variety of the former.

The next two notices of this shell are by Mr. King, "Cat. Org. Remains," &c. p. 13, and "Perm. Mon." pp. 209, 210. In both these works it has the following "diagnosis:"—

"Loxonema fasciata, n. sp. *A subulate, many-whorled, smooth species, with two or more dark-spiral bands, crossed by others, on a light ground; its outer lip is inversely sigmoid.*"

If this "diagnosis" had not been accompanied with a figure, I could not have identified it with the preceding shells; but the figure in "Perm. Foss." tab. 16, f. 30, establishes its relationship to them without doubt, and at the same time it shows that Mr. King's "diagnosis" of the species is incorrect. The general form is not "*subulate*," but turreted, or tower-shaped, as Geinitz expresses it. The terms "dark-spiral" and "inversely sigmoid" are not very intelligible.

In "Perm. Mon." Mr. King places both the *Turritellæ* described in the "Tyneside Catalogue" with his *L. fasciata*. This would not have surprised me in the least, had he not immediately afterwards ("Perm. Mon." p. 210) redescribed the *Turritella Phillipsii* under a new specific name, *Loxonema Geinitziana*. That the shells described under both these names are identical, cannot be denied by any one able to admit the truth; and it is certainly much to be regretted that such an oversight as this, and many others pointed out in this paper, disfigure the fair pages of the "Permian Monograph."

In the "Journal of the Dublin Geol. Soc.," April 1856, Mr. King mentions, under the name *Rissoa? Altenburgensis*, Gein., the occurrence of this little shell in the Permian rocks of Ireland.

Lastly, in Germany, Baron Schauroth, in his last contribution on Permian Fossils (Zeitschr. d. deutschen geologischen Gesellschaft Jahrg. 1856, s. 241, 242), adopts for this species King's inappropriate epithet, *Geinitziana*, and unites with it the *L. fasciata*, King, and the *Turbonilla Altenburgensis*, Geinitz. In the same paper the *Loxonema Geinitziana*, King, is redescribed under the new name *Rissoa gracilis*. I have been favoured by Baron Schauroth with some carefully-made clay-casts of these shells, and I think they are perfectly identical with those from the English Permians.

All the shells enumerated above are, I believe, referable to one species; and the name given to it by Geinitz originally must be adopted until it is certainly known whether the Russian species mentioned above are really identical.

In addition to the characters given above under *Turritella Phillipsii*, it may be stated that in very many specimens the whorls are very much flattened or bevelled, both above and below, causing a deep suture, and the middle part of the whorls to appear as if doubly keeled. In some few specimens, indeed, there are indications of obsolete spiral striæ, and Mr. Kirkby has collected one specimen in which the last two whorls have several very strong spiral striæ, though the other whorls have the smooth normal appearance only. This tendency of the

whorls to a double keel inclines me strongly to think that the *Murchisonia subangulata*, Geinitz, is only the same shell; and it is also very probable that the original Russian species, *Turritella biarmica*, Kut., and *M. subangulata*, Vern., are identical with the present species. Some of Mr. Kirkby's specimens also show two or three coloured spiral bands running round the whorls parallel to the suture, as figured by Mr. King in the "Perm. Mon."

It occurs in the shell-limestone of this district, chiefly at Tunstall.

32. LITTORINA, *Férussac.*

1. L. HELICINA, *Schloth. sp.* Pl. XI. figs. 19, 20, *vars.*

Most authors describe the typical form of this species as having only three or four whorls, yet all the best full-grown specimens have five or six. The nucleus of the shell and the succeeding whorl are quite smooth, and in a few instances this smoothness is continued through the whole period of growth. This variety is termed *Rissoa obtusa*, Brown, and *Turbo Permianus*, King. Generally, in the typical *L. helicina*, after the first two or nucleal whorls, the shell begins to be ornamented with more or less numerous, much or slightly developed striæ running parallel with the suture, which are fewer, stronger, and more prominent on the middle, and fainter and more numerous on the lower part of the whorl. The spire also in some instances is much drawn out, in others much depressed, causing the body-whorl to appear in the latter case much larger than usual. The ornament of the shell has sometimes the form of flattened, angulated planes over the upper part of the whorls, which are in a few instances so obscure as to be scarcely perceptible (see Pl. XI. figs. 19, 20), and it is thus that the typically ornamented forms are united with the smooth variety above mentioned. I can find no character by which to distinguish the *Turbo Mancuniensis*, Brown, from this, which certainly is identical with typical specimens of *Trochilites helicina*, Schloth., received from Germany. A glance at the figures in the "Perm. Mon." tab. 16, f. 19–22, is sufficient to convince any sound naturalist of the identity of *helicina* and *Mancuniensis*.

The form which was separated under the epithet *L. Tunstallensis* in the "Tyneside Catalogue," and in the "Cat. Org. Rem." under the specific name *Turbo Thomsonianus*, must also be referred to the *L. helicina*. It is smaller than the typical form of *helicina*, and the spire is considerably drawn out, which gives the whorls a much rounder appearance, and the striæ are finer and closer to each other, and do not affect the rotundity of the whorls, as in typical individuals. The *Rissoa Gibsoni*, Brown, appears to be only a cast of this variety, which is also described by Geinitz as *Trochus pusillus*, Verst. pl. 3, f. 15, 16.

King's *T. Taylorianus* is, I think, a very stunted form of this species. It has the spire only very slightly elevated, and the striæ are more numerous, more closely set, and thicker in appearance than usual.

To the typical form of this species, *Trochilites helicina*, Schloth., may be added the *Turbo Mancuniensis*, Brown, and the *Turbo minuta*, Brown.

In the first variety may be placed *Rissoa obtusa*, Brown, *Natica minima*, Brown, and *Turbo Permianus*, King; and in the second variety, *Rissoa Gibsoni*, Brown, *Trochus pusillus*, Geinitz, *Littorina Tunstallensis*, Howse, and *Turbo Thomsonianus*, King.

Note on the originals of Capt. Brown's species.—Turbo Mancuniensis. Mr. Binney's three original specimens of this shell, from the Permian marls of Lancashire, are rather more obtuse in the spire than those from the shell-limestone of this district. The whorls have also a more rounded appearance. One of the specimens was worn, and very much rubbed. The other two had the marking sharp and well defined. Aperture nearly circular, with a slight notch behind the pillar-lip, but no umbilicus. The largest specimen, which shows the mouth, not quite perfect, is one-fourth of an inch in length. It has three strong ribs on the body-whorl, with an intermediate faint one above, and several smaller, closer striæ beneath. The two specimens of *Turbo minutus* in the same collection are undoubtedly, as I pointed out formerly in the "Tyneside Catalogue," only the younger state of *T. Mancuniensis*, as is well shown by the unfinished state of the mouth of one of the specimens.

Two of the original casts of *Rissoa obtusa*, Brown, are not in a state good enough to describe. One of them is very much compressed. The other specimen is more perfect than these, but is also a cast. It has four rounded whorls and a short spire, but the apex is not quite perfect. The *Natica minima*, Brown, a cast with imperfect spire, is undoubtedly the same as *R. obtusa*. The originals of Capt. Brown's *Rissoa Gibsoni* are also casts. Two of them are very much compressed, so that the spire has not the natural appearance. The third specimen closely resembles the *R. obtusa*, but its spire is longer, being more perfect than the others at the apex.

The estuarine character of these Lancashire shells was pointed out, many years ago, by Mr. Binney, in the "Manchester Geological Transactions," vol. i., and this opinion was very forcibly impressed upon me when examining the originals belonging to that gentleman. The larger and more typical individuals from the shell-limestone of Durham have probably lived in less confined habitats, but still they have a decidedly littoral character. It must be mentioned here that I have used the term "littoral" in contradistinction to "pelagic," and not in the limited sense in which it is used by British naturalists.

This species occurs in the middle and upper divisions of the magnesian limestone, but the most typical and finest specimens are from the shell-limestone of Tunstall.

2. L. Hercynica, *Geinitz.*

Dr. Geinitz had described and figured this species in the "Versteinerungen," several months before Mr. King's imperfect notice of it in the "Cat. Org. Rem." appeared. It was identified in the "Tyneside Catalogue" with *Natica minima*, Brown; but an examination of the latter proves this identification to be incorrect. Dr. Geinitz and Mr. King both place this shell in the genus *Natica*, but it is rather difficult to comprehend why they do so, for it has a nearly orbicular mouth, is not apparently a polished shell, is not umbilicated, and bears a strong resemblance to the *Littorinæ*. By comparing the mouth of this species (Perm. Mon. pl. 16, f. 28) with that of *L. helicina* (pl.

16, f. 22), it will be seen how strikingly similar to each other they are in form. In Mr. King's figures, the spire of the shell is represented much too high, and his "diagnosis" is so jumbled, that it would be in vain to hope to identify the species by it.

The surface of the shell is ornamented with very fine, wavy, longitudinal striæ. This peculiar character is well displayed on some specimens collected by Mr. Kirkby at Field House.

Baron Schauroth has lately united this species to the *Euomphalus Permianus*, King, at the same time removing the latter into the genus *Rissoa*. After examining some examples of this supposed species from both German and English localities, I think it is probably only the young of *Littorina Hercynica*. The figure given by Mr. King, with its few whorls and unfinished mouth, is evidently only a young shell.

In the shell-limestone of Tunstall, Silksworth, and Field House, but not common.

33. PLEUROTOMARIA, *Defrance*.

1. P. ANTRINA, *Schloth*. Pl. XI., figs. 21, 22, 23, 24, 25.

In well-preserved specimens of this shell, the whole of the surface is ornamented with distinct longitudinal lines, but they are never so much raised as in the following species, and the surface never presents the same finely decussated appearance. In young specimens the suture follows the line of the fissure of the preceding whorl, but it falls considerably below it in some adults, which have consequently a less conical appearance. The upper surface of the whorls is either slightly arched or nearly flattened, and this variation is respectively represented on the under surface, which has, in the latter case, a flattened, truncated, and in the former a tumid appearance. These variations are shown in the figures referred to in the accompanying plate.

The false species and erroneous identifications of this very characteristic shell are corrected in the table given at p. 245.

Rather plentiful in the shell-limestone of Tunstall, but rare in several other localities.

2. P. VERNEUILI, *Geinitz*.

I find that Baron Schauroth has identified the *Pleurotomaria*

nodulosa, King, with the *Pleurotomaria Verneuili*, Geinitz. As this identification is undoubtedly correct, and as Geinitz's description and figure appeared several months before King's Catalogue, the name adopted above has right of priority.

In well-preserved specimens the whole surface of the shell is ornamented with strong, longitudinal, raised lines, which being cut obliquely by the strong lines of growth, give the whole surface a beautiful, decussated appearance. The double row of nodules is not so persistent a character as the former, for the sutural row is not seen on young individuals, and the row placed below the fissure becomes obsolete in very large full-grown specimens. It appears to have been the most beautiful and delicate shell of the Permian seas, and from the numerous examples of bored shells that occur—a fact which I first pointed out to Mr. King—it probably, with its congener, *P. antrina*, preyed upon its more peaceful and unprotected neighbours.

The specimen figured in "Perm. Mon." is a young individual. The largest specimen I have seen exceeded an inch in length and width.

It occurs in the shell-limestone of Tunstall and Humbleton.

34. DENTALIUM, *Linn.*

1. D. Speyeri, *Geinitz.*

Mr. Kirkby has recently found a very fine specimen of a *Dentalium*, which, after seeing both German and English specimens, I think is referable to the above species. The German specimens I saw in the superb cabinet of Permian fossils collected by Mr. R. Eisel, jun., in the neighbourhood of Gera. Baron Schauroth has also noticed its occurrence in the same locality, under King's name, *Dent. Sorbii;* but it would be quite impossible to determine, without seeing the specimen, whether the one mentioned by Mr. King is identical with the present species. Both King's and Geinitz's names were published in 1850.

In the shell-limestone, Tunstall Hill.

CEPHALOPODA.

35. NAUTILUS, *Breynius.*

1. N. Frieslebeni, *Geinitz.* Pl. XI., fig. 26, *juv.*

If, instead of dismembering this fine species, Mr. King had endeavoured to trace its variations through all its periods of growth up to the adult state, he would have deserved our best thanks, and would have contributed something towards the full understanding of its true character. But it has pleased him better, instead of so doing, to represent and describe the young of it as a new species,—*N. Bowerbankianus.* The last chamber only is the part principally represented of *N. Frieslebeni*, and from it the characters of the whole shell, with the aid of Geinitz's description, appear to be drawn; for the figure, pl. 17, fig. 16, does not contribute much towards the elucidation of the species.

If one examines the principal characters of Mr. King's new species, viz., "*deeply umbilicated; whorls increasing rather rapidly in size; slightly embracing* (?) *each other*," it will be seen that they are only the characteristics of young individuals; if they are anything more, it will be necessary, in order to establish the specific identity of *N. Bowerbankianus*, for Mr. King to represent the young state and mode of growth of *N. Frieslebeni*, and show in what points they differ. Until this has been done, it is better to consider *N. Bowerbankianus* as the young state of the present species. Here also must be placed the *Naut. Theobaldi*, Geinitz, which, after examining a specimen, I could not distinguish from the above.

Very young specimens are much rounded in form, and ornamented with strong, decussated striæ. The outer chamber of Mr. Kirkby's largest specimen is nearly four inches in length, and two and a half in greatest breadth.

In the shell-limestone of Tunstall, Humbleton, Dalton-le-dale, &c., and, according to Mr. King, in the compact-limestone of Whitley.

PTEROPODA.

36. THECA? *Morris.*

1. T? Kirkbyi, n. s. Pl. XI. fig. 27, *restored.*

Shell straight, tapering gradually; aperture transversely oval; surface with small, transverse, wavy furrows; four thin decurrent wings run along the whole length of the shell.

This is the only Pteropod that I am acquainted with in the English Permians. The restored outline in the accompanying plate will serve to give an idea of its form and size. I have found only one specimen which shows the above characters, and which indicates probably a closer alliance with the *Creseis*, Rang, than with the genus in which it is provisionally placed.

It is dedicated, with great respect, to Mr. James Kirkby, of Sunderland.

From the shell-limestone of Tunstall.

37. PINNA, *Linn.*

1. P? prisca, *Mün.**

Solen? pinnæformis, Geinitz, *Verst.* p. 8.

Within the last few weeks, Mr. Kirkby has found an interesting specimen of this rare species in the shell-limestone of Tunstall Hill. Last year I had an opportunity of examining a fine series of specimens, collected in the neighbourhood of Gera, by Mr. Dinger, Mr. Robt. Eisel, and the Pastor Macroth. Mr. Dinger having kindly presented a fine specimen to me, and having also secured another smaller example from the Zechstein quarries, in the neighbourhood of Gera, I am able to state, with great certainty, the identity of Mr. Kirkby's fossil with the above well-authenticated species.

In the "Perm. Mon.," p. 4, Mr. King refers the *Pinna? prisca*, Münst., to the *Caulerpa selaginoides*, Sternb., and remarks that "it is difficult to conceive the figure, in Count Münster's 'Beitrage,' to be any thing else but the stem of this plant." The

* "Beitr. I.," 1839, p. 45, H. 4, f. 4; 1843, p. 66, H. 4, f. 4.

occurrence of this shell in the above localities affords me much pleasure, as it enables me to correct the false impression which this learned Permian palæontologist has so long and so unnecessarily entertained.

On a future occasion I hope to make a few remarks on the remaining portion of the fauna of the Permian System.

EXPLANATION OF PLATE XI.*

Figs. 1, 2. *Productus latirostratus*, Howse, from the shell-limestone, Dalton-le-Dale.

Figs. 3, 4. *Camarophoria Humbletonensis*, Howse, from the shell-limestone Humbleton.

Figs. 5, 6. *Spiriferina cristata* Schloth. sp., from the shell-limestone, Tunstall.

Fig. 7. *Solemya normalis*, Howse, from the shell-limestone, Humbleton.

Figs. 8, 9. *Solemya biarmica*, De Verneuil, from the shell-limestone, Silksworth.

Figs. 10–13. *Edmondia elongata*, Howse, from the shell-limestone, Tunstall and Humbleton. 11. Cast showing fissure left by the subumbonal blade or plate. 12. Hinge-margin removed, showing the form of the subumbonal blade.

Figs. 14, 15. *Tellina Dunelmensis*, Howse, from the shell-limestone, Humbleton.

Figs. 16, 17. *Calyptræa antiqua*, Howse, from the shell-limestone, Tunstall.

Fig. 18. *Chemnitzia Altenburgensis*, Geinitz, sp. = *Turritella Phillipsii*, Howse, from the shell-limestone, Tunstall.

Figs. 19, 20. *Littorina helicina*, Schloth. sp.; varieties with nearly obsolete spiral bands, from the shell-limestone, Tunstall.

Figs. 21–25. *Pleurotomaria antrina*, Schloth. sp. 23. Typical form and varieties, from the shell-limestone of Silksworth and Dalton-le-Dale.

Fig. 26. *Nautilus Frieslebeni*, juv., Geinitz, from the shell-limestone, Silksworth.

Fig. 27. *Theca? Kirkbyi*, n. s., from the shell-limestone, Tunstall.

Fig. 28. *Retepora Ehrenbergi*, Geinitz, from the shell-limestone, Silksworth. *a*, portion of the large individual figured in "Perm. Mon." t. 5. f. 1.; *b*, young individual; *c*, fragment enlarged, showing interstices and polype-cells; *d*, fragment slightly enlarged, showing the reverse or non-celluliferous surface.

Fig. 29. *Caryophyllia quadrifida*, Howse, from the shell-limestone, Humbleton; *a*, *c*, coral-stem, natural size; *b*, cast showing the position of the laminæ or plates.

* The use of this plate has been kindly permitted by the editor of the "Annals of Natural History," and corresponds with pl. 4, vol. xix. of that work.

X.—*On some Permian Fossils from Durham.* By Mr. J. W. Kirkby.*

This communication comprises a notice of the occurrence of a malacostracous Crustacean and of a new species of *Chiton* in the Magnesian Limestone of Durham, together with remarks on some other Permian fossils.

1. Prosoponiscus problematicus, *Schlotheim, sp.* Pl. XII. figs. 1–7.

Trilobites problematicus, *Schlotheim, Petrefact.* 1820, *p.* 41.

Palæocrangon problematica, *Schauroth, Zeitschr. deut. geol. Gesell.* 1854, vi. *p.* 560, *pl.* 22, *figs.* 2, *a–e.*

In the summer of 1853, I found two imperfect specimens of one of the higher (malacostracan) Crustaceans in the limestone at Humbleton Quarry. At the time I thought that the species belonged to the *Macrura;* but I now find this was an error. A short notice of this interesting discovery appeared in the Address of the President of the Tyneside Naturalists' Field Club, March 15, 1854.†

At that time I believed that none but the lower forms of Crustaceans had been previously found in the Permian rocks. I have since learned, however, that in Schlotheim's "Petrefactenkunde," 1820, p. 41, mention is made of the discovery (in the Zechstein-dolomite of Glücksbrunn) of a peculiar fossil, named by Schlotheim *Trilobites problematicus*, which is probably the same species as mine.

In 1854, Baron Schauroth‡ authenticated Schlotheim's discovery, and figured and described a specimen of this species as belonging to one of the higher groups of *Crustacea*, naming it *Palæocrangon problematicus.* On comparing my specimens with the figures given by Schauroth, I have a little hesitation in regarding them as belonging to the same species; but as "Palæocrangon" does not express the affinities of the fossil animal, I

* Communicated to the Geological Society of London, and printed in their Quarterly Journal, vol. xiii. p. 213.

† Transactions of the Tyneside Nat. Field Club, vol. ii. p. 333.

‡ Zeitschrift der deutsch. geolog. Gesell. vol. vi. p. 560, pl. 22, fig. 2.

propose, as a more correct generic term, the name *Prosoponiscus*,* as suggested by a palæontological friend.

Though my original specimens are in no respect inferior to those of Schauroth's, I did not venture to name and describe them when they were first noticed, but postponed doing so in the expectation of procuring more examples, and obtaining a more definite knowledge of the affinities of the species. It was not, however, until the summer of the present year that any further traces of it were found, when one or two other fragments from a different locality were met with. In all, six specimens have been obtained: two from Humbleton Quarry, three from Field House, Ryhope, and one from Tunstall Hill.

Drawings of the most perfect of these have been submitted to Mr. C. S. Bates, and I am indebted to that gentleman for the following interesting remarks:—

"There is but one order among recent *Crustacea* with which figs. 1 and 2 can be identified, and that is the *Isopoda*. But the relation of the fossil to the recent species is peculiar. In all recent forms (as far as I know) where the eyes project upon the surface of the integument, the cephalic region is small, being less than the next succeeding segment; but this fact, which is very constant in the adult animals, is not permanent in the larval condition of the same; the head or cephalic segment being more important in relation to the succeeding rings. But from all the larval or adult forms of prominent-eyed *Isopods* this fossil specimen differs in the anterior position of the eye. This may be a specific distinction only.

"The fact that this *Isopod*, found in so early a geological period, assumes rather the larval than the adult form of the recent type, is consonant with all we know of the relation which animals generally of so early a date hold to existing species."

We must therefore, it appears, look upon our fossil Crustacean as belonging to the family *Isopoda*, though somewhat of an abnormal character in reference to the recent forms.

Baron Schauroth's specimen from the Zechstein-dolomite of

* From *prósopos* (Gr.), a face or mask, and *óniskos* (Gr.), oniscus.

Pössneck appears to consist of four body-rings and the two posterior segments.* I have been fortunate, however, in procuring one specimen showing the cephalic segment or carapace, with two body-segments attached. (Pl. XII. figs. 1, 2, 3.)

The carapace is about as long as four of the succeeding body-rings, somewhat less in depth, and slightly compressed laterally; it is carinated along the back, and wedge-shaped in front; the eyes are large, round, and prominent, and are placed far forward; from the lower part of each eye runs an indented line, at a short distance from the margin, up to the dorsal region, where it curves forward.

The other five specimens consist of body-rings (2 to 6 in number) and the two great posterior or caudal segments;† and are very similar to the figures given by Schauroth. In one of the Durham specimens (fig. 7) there are six body-rings, and two posterior segments; the others (figs. 4, 5, 6) have likewise the two latter segments, but not so many of the former. The body-segments are narrow, almost uniform in size, but varying a little in depth, the central ones appearing to be the most produced; they overlap each other and the penultimate segment posteriorly; they are slightly compressed, and have traces of a median dorsal ridge; those in front have their extremities turned a little forward, while the posterior ones are bent in the contrary direction. The large penultimate segment is greatly developed laterally; it is strongly carinated dorsally; its ventral margins are slightly convex, as is also the posterior border, which has a deep notch not far from the dorsal ridge; the ridge or keel of this segment is very prominent except anteriorly, where at each side of the dorsal line is a transverse swelling; it is compressed also posteriorly. The next segment, which is the hindermost known, is more compressed than the preceding one, and considerably smaller.

None of the English specimens show the true external surface, nor have any traces of feet or of antennæ been found.

The specimen with the carapace (figs. 1–3) is one-eighth of an

* The latter are regarded as the cephalic and thoracic segments by this author.

† It is probable that we have all the hinder segments in these specimens; but there may possibly be a small terminal one besides.

inch long. The largest of those with the body-segments only (fig. 4) is nearly half an inch in length.*

2. Chemnitzia Roessleri, *Geinitz, sp.* Pl. XII. fig. 8.

Loxonema Roessleri, *Geinitz, Jahresbericht Wetterauisch. Gesell.* 1850–51 ; *Schauroth, Zeitschr. deutsch. geol. Gesell.* 1854, vi. 538. *pl.* 21. *fig.* 9.

In 1853 I obtained a very fine specimen of a ribbed *Chemnitzia* at Humbleton Quarry, which agrees very well with the *Loxonema Roessleri*, Geinitz, as figured by Baron Schauroth in the "Zeitschrift d. deutsch. geol. Ges." 1854, vol. vi. p. 538, pl. 21, fig. 9. A notice of the occurrence of this interesting fossil was given, together with that of the above-described Crustacean, in the "Transactions of the Tyneside Naturalists' Field Club," vol. ii. p. 333.

The first account of a ribbed *Chemnitzia* from the Permian rocks is found in Mr. Howse's "Catalogue of Permian Fossils."† This is probably the same as the one now before us ; and is undoubtedly distinct from *Loxonema Swedenborgiana*, King (Monograph Perm. Foss. p. 210), though Baron Schauroth is disposed to consider the two identical. The size, however, is sufficient to distinguish them.

I have given a figure of this specimen (fig. 8), as Schauroth's figure is from a very imperfect individual. My specimen is perfect with the exception of two or three of the apical whorls ; the six whorls that remain give a very good idea of the species. This shell is long and slender, tapering gently to an apparently very fine point ; the whorls (which, when entire, probably numbered eight or nine) are somewhat convex, rather tumid behind, with the suture deep ; they are covered with thick, close-set, transverse ribs, giving to the shell a fluted appearance ; the large whorls have about eighteen ribs each, and are finely striated on the under surface. The pillar-lip, as far as can be observed, is straight, but the greater portion of the aperture is hidden in the matrix.

There is little doubt that this is a true *Chemnitzia:* the form of the shell, the character of the whorls with their ribs, the deep

* See Note 1, at the end of this Paper.

† Transact Tyneside Nat. Field Club, vol. 241.

suture, and straight columella, pronounce it to belong to this genus. The whole habit of the shell, too, is very similar to that of *Chemnitzia*.*

3. Chiton Howseanus, *sp. nov.* Pl. XII. figs. 9–13.

Three plates of a *Chiton* have occurred at Tunstall Hill, which, on a careful examination, appear to be distinct from *Chiton Loftusianus*, King (Monog. Perm. Foss. p. 202. pl. 16. figs. 9–14), of which I have a full series.

Of the new species two of the plates are intermediate (figs. 10, 11, 12), and one anterior (fig. 13). The former plates are not much compressed; they are wide and obtusely angulated, not much pointed posteriorly, and they have a surface finely granulated; the lateral areas, which are rather wide, are not strongly marked, and the lines of growth are indistinct; one or two wide grooved lines, commencing at the posterior margin, run parallel to the lower margin, and are continued faintly to the anterior dorsal region. The anterior plate (fig. 13) is marked in a similar manner. The processes for insertion are more prominent, narrower, and not so regularly arched as the apophyses of *C. Loftusianus* (fig. 9).

C. Howseanus may be readily distinguished from the last-named species, which is the only other *Chiton* found in the Permian rocks, by the flatness and greater width of the plates, by the obscurity of the lateral areas, and smoothness (want of strong lines of growth) of the plates. The one or two grooved lines which follow the margin are also characteristic.

I have great pleasure in dedicating this species to Mr. R. Howse, the author of an excellent "Catalogue of the Fossils of the Permian System of the Counties of Northumberland and Durham," and "Notes on the Permian System of Durham," &c.†

4. Lima Permiana.

Lima Permiana, *King, Monog. Perm. Foss.* 154. *pl.* 13. *fig.* 4.

It may be interesting to mention that this species, which Professor King founded upon the knowledge of a single valve from

* See Note 2. † See Note 3.

Humbleton Quarry, is not of rare occurrence at Tunstall Hill, and at Field House, Ryhope; from which localities I have obtained a very fine series of specimens, completely illustrating and establishing the species.*

This species, in common with all *Limæ*, is characterized by a hinge-area, by its being devoid of a notch under the front ear of the right valve, and by the obliquity of its valves; also by its hinge-area being narrow, its ears small, and its valves smooth, which latter slope gradually and shut close.

5. Hippothoa Voigtiana, *King, sp.* Pl. XII. figs. 14, 15.

Aulopora Voigtiana, *King, Monog. Perm. Foss.* 31. *pl.* 3. *fig.* 4.

Prof. King, in his "Monograph of Permian Fossils," gives a short account of this fossil under the generic appellation of *Aulopora*. His description and figures were from casts, no testiferous specimens having been procured at that period, and were necessarily incomplete. As I have been so fortunate as to find a perfect example of this fossil, I have deemed it desirable to give a new figure, and to describe the species afresh.

The cells are oval, widest in front, produced or slender behind; they are placed rather near to each other, the connecting threads being short and thicker than usual; the aperture, which is situated at the distant extremity of the cell, is rather large, circular, and protected by a smooth raised lip.

My specimen is not much branched; but the branches always arise from the anterior portion of the cell at an obtuse angle.

This fossil is undoubtedly a *Bryozoon;* and, as the genus *Aulopora* is stated by MM. Edwards and J. Haime to be only the young stoloniferous base of a *Syringopora*, I have, after an attentive examination of its affinities to existing genera, placed it in the genus *Hippothoa*, to which it bears a strong resemblance and evidently close relation.

The specimen figured is from Tunstall Hill, and is attached to the external surface of a *Terebratula elongata.*†

* In the paper already referred to, Baron Schauroth describes and figures a variety (*subradiata*) of this species.

† See Note 4.

Notes added since the preceding Paper was communicated to the Geological Society.

1. Prosoponiscus Problematicus, *Schloth.*

Since the preceding remarks were written I have found another specimen of this interesting species. Like the others, it is fragmentary; but as it is the anterior portion of an individual, and possesses the carapace, with four of the body-rings attached, it is not without importance. It is, allowing for two additional segments, about twice the size of the anterior portion figured. The size of the carapace, compared with that of the body-rings, scarcely appears to be so large in this example as in the former. This in some measure seems to be due to the extension of the segments, the individual having been incurved, consequently the body-rings are drawn out, and their length seems to be greater, in proportion to their depth, than those of figs. 1 and 2, which represent these segments as overlapping. But allowing for a greater exposure of the body-rings in the larger specimen, the carapace is still, in a relative sense, of smaller dimensions than the other; in other respects the specimen agrees with the former. The carapace is of similar form, and is marked with the same marginal indentation. The eyes are as far forward, and just as prominent; and both the carapace and the body-rings are characterised by a dorsal ridge.

It is to be hoped that a perfect example of this rare species will shortly be discovered, or at least a specimen or specimens more perfect than those hitherto found, so that we may know the true relation which the large penultimate segment bears to the body-rings, and the number of these which intervene between it and the carapace. Such a specimen would also set at rest all doubts as to the specific identity of the two series of fragments—the anterior portions, and those I have termed posterior. However, as yet, it seems safer to refer both to one species than to consider them distinct, for though they may possibly belong to different species, yet when we consider that the posterior segments of the one are in all respects identical with the anterior of the other, it seems more likely that we have

found fragments of different individuals belonging to only one species.

In addition to the above, it may also be mentioned that a minute fossil, resembling a claw, or a portion of some forceps-like instrument, has also occurred, which very probably belongs to some of the anterior extremities of this animal.

Respecting the specific identity of the German and British specimens, there cannot be any doubt. The Baron von Schauroth has very kindly favoured me with a specimen of *Palæocrangon problematica*, which, together with a series of clay casts of other German specimens, quite establishes their identity with the posterior fragments of our own district.

2. Chemnitzia Roessleri, *Geinitz, sp.*

During the past year this species has repeatedly occurred to me at Tunstall Hill. One perfect individual has nine whorls; the apex is finely pointed, and the aperture is ovate, with a reflexed inner lip.

3. Chiton Howseanus, *sp. nov.*

Professor De Koninck has lately described—in the "Bulletins de l'Academie Royale de Belgique," 2me serie, 1857—a new species of Chiton (*C. Grayanus*), from the Upper Silurian of Dudley, which bears a strong resemblance to this species.

4. Hippothoa Voigtiana, *King, sp.*

Although I have discovered several new specimens of this *Polyzoon* at Tunstall, it is somewhat remarkable that the cells of all of them are as minute as those of the specimen which is figured, and that in no instance do they approach in size the cells of the specimen which Professor King found at Humbleton. This peculiarity may be due to some local variation of condition, under which these members of the species existed, or it may imply a specific distinction; but until perfect, or more complete specimens, of the Humbleton variety be found, it will perhaps be as well to consider both of them as belonging to one species. The examples lately found add little to our previous knowledge

of the species. Some of them are more branched, and show a greater aggregation of cells than the one figured.

EXPLANATION OF PLATE XII.*

Figs. 1, 2. *Prosoponiscus problematicus*, Schloth. sp. Lateral views of anterior portion. From Humbleton Hill. } Magnified ten times.
Fig. 3. The same. Dorsal view. }
Figs. 4, 5. The same. Lateral views of posterior portion. From Humbleton Quarry. Magnified six times.
Fig. 6. The same. Lateral view of posterior portion. } From Field House, Ryhope.
Fig. 7. The same. Dorsal view of posterior portion. } Magnified seven times.
Fig. 8. *Chemnitzia Roessleri*, Geinitz, sp. From Humbleton Hill. Magnified four times.
Fig. 9. *Chiton Loftusianus*, King. Lateral view of an intermediate plate; enlarged. (For comparison with fig. 10.)
Fig. 10. *Chiton Howseanus*, Kirkby. Lateral view of an intermediate plate. (Enlarged.) } From Tunstall Hill.
Figs. 11, 12. The same. Intermediate plate. (Enlarged.)
Fig. 13. The same. Anterior plate. (Enlarged.)
Fig. 14. *Hippothoa Voigtiana*, King, sp. } Magnified sixteen times.
Fig. 15. The same. Side-view. }

* This plate corresponds with pl. VII., vol. xiii., of the Quarterly Journal of the Geological Society of London, by whose obliging permission it appears in these Transactions.

XI.—*Notice of Insects added to our Fauna, during the Year* 1856.

By Thos. Jno. Bold.

[Read, May 19, 1857.]

Amongst the additions made to our insect fauna, during the year 1856, will be found some species of very great rarity, and which are now for the first time recorded as British. One of these, however, will not, I fear, be regarded as an acquisition, or looked on with much favour, for, belonging to a tribe of insects whose irritating punctures are so familiar to all, I can scarcely hope our members to hail with pleasure the addition to our local fauna of a flea, at least ten times the bulk of the common species, although it comes under their notice with the high-sounding title of Emperor. One consolation, however, I must not omit to mention, to wit, the fact that he was dead when found, and that, so far, no heirs of the Imperial line have turned up to claim the family honours: let us hope that he was the last of his race.

COLEOPTERA.

1. *Cercyon laterale*, Steph., Muls. In fungi: Gosforth, Axwell, Long Benton, &c. July—October.

2. *Cercyon terminatum*, Marsh,=*scutellare*, Steph.,=*plagiatum* Erichs. Rare: Gosforth, Long Benton, Tynemouth. March and April.

3. *Cercyon aquaticum*, Steph., Muls. On hotbeds, in dung, and fungi: not uncommon throughout the district. April—October.

4. *Oxypoda ruficornis*, Gyll. Exceedingly rare: one specimen taken at Gosforth, in fungi. October.

5. *Oxypoda annularis*, Saplb., Erich., Kraatz. In moss: Thrunton, in January, and Gosforth, in May.

6. *Phytosus nigriventris*, Chev., Kraatz. Beneath Algæ, on the sea-coast, Marsden, Whitley, &c.

7. *Homalota sericea*, Muls., Kraatz. Very rare: near Washington, in September.

8. *Homalota monticola*, Thoms., Kraatz. A single specimen, taken with the preceding.

9. *Homalota rupicola*, Kies., Kraatz. A pair, taken on the mud of the lake, at Gosforth, in July.

10. *Homalota gregaria*, Erich., Kraatz. Very rare in this district.

11. *Goerius similis*, Fab. Mr. J. Thornhill has the credit of adding this fine species to our fauna, having found a specimen near Bradley, in August last. It appears to affect elevated districts, as I have taken several specimens on the hills east of Lannercost, in Cumberland; generally in July.

12. *Quedius laevigatus*, Gyll. Beneath moss: Gosforth; in February, but rare.

13. *Phlaeobium clypeatum*, Müll. One individual; same locality and date as preceding.

14. *Trogophlœus omalinus*, Erichs. Exceedingly rare: Wylam; September.

15. *Stenus plantaris*, Erich. Three specimens, taken at Gosforth.

16. *Brachypterus pubescens*, Erichs.=*Cateretes Glaber*, Neurn., Steph. Two specimens; taken in the district, but in what particular portion of it I have omitted to note.

17. *Geotrupus putridarius*, Esch.=*stecorrarius*, *et punctato-striatus*, Steph. Exceedingly common, but hitherto confounded with *stercorarius*, Linn.

18. *Haltica flexuosa*, Marsh. Equally abundant, and quite as destructive as the common turnip-flea (*H. nemorum*), but from its great similarity, mixed up in my collection with that species. I have taken and received specimens of it from nearly all parts of the district.

DIPTERA.

Pulex Imperator, Westwood. A friend of mine, resident in Gateshead, brought an immense flea, which he had found in his bed, for my examination. Not being able to identify it, I forwarded the creature to J. O. Westwood, Esq., by whom it has been described as new, under the above appellation, in a paper recently read before the Linnæan Society.

THOS. JNO. BOLD.

Long Benton, May 16, 1857.

MONTHLY REGISTER OF THE RAIN-FALL FOR 1856,

IN INCHES.

	Allen-heads.	Bywell.	Wylam.	Durham.	Washing-ton.	North Shields.	New-castle.	Stamford-ham.	Lilburn.	Roddam.	Howick.	Bishop-Wear-mouth.	Whorlton, Teesdale.
Elevation above Sea-level in Feet	1,360	74	80	339	120	120	187	380	...	...	...	130	450
January	3·267	1·940	1·67	2·50	1·88	4·077	1·15	3·81	2·385	3·04	0·85	1·52	1·66
February	3·019	1·55	1·55	1·09	1·11	2·446	1·17	1·98	1·530	1·82	0·89	0·92	1·40
March	0·424	0·13	0·14	0·32	0·18	0·150	0·02	0·32	0·305	0·34	2·98	0·09	0·55
April	3·727	2·73	2·27	2·28	2·61	4·078	1·24	4·34	3·340	3·62	1·41	1·80	2·49
May	4·804	4·19	3·37	4·40	3·81	6·845	4·43	5·45	1·610	3·26	1·15	3·00	2·65
June	3·422	2·73	2·90	2·49	2·58	5·660	2·23	6·11	3·270	3·67	2·19	2·13	2·64
July	1·653	1·00	1·71	1·75	1·78	3·366	0·99	2·01	3·800	3·30	0·94	1·42	2·64
August	5·069	3·62	3·85	4·12	3·53	7·872	3·14	7·00	3·095	3·24	3·20	2·22	4·34
September	8·582	5·35	4·83	5·01	3·96	6·504	3·63	6·98	6·685	9·45	3·49	2·30	3·11
October	1·967	1·27	1·03	1·44	0·98	1·201	0·49	1·69	1·280	1·59	0·80	0·52	1·56
November	1·680	1·60	1·42	1·41	1·26	1·716	0·46	1·90	1·781	2·01	0·86	0·55	0·47
December	7·870	3·71	4·51	2·84	2·32	6·921	2·28	5·15	3·815	6·35	3·82	1·65	3·79
Total	45·484	29·82	29·25	29·65	26·00	50·836	21·23	46·74	32·896	41·69	22·58	18·12	27·30

MONTHLY REGISTER OF THE RAIN-FALL FOR 1857,

IN INCHES.

	Allen-heads.	Bywell.	Wylam.	Durham.	Washing-ton.	North Shields.	New-castle.	Stamford-ham.	Lilburn.	Roddam.	Howick.	Bishop-Wear-mouth.	Whorlton, Teesdale.
Elevation above Sea-level in Feet	1,360	74	80	339	120	120	187	380	...	...	...	130	450
January	4·643	2·440	2·54	2·42	1·23	2·839	1·36	3·24	2·780	3·09	1·35	1·14	2·16
February	2·414	1·000	1·15	1·02	1·19	·793	0·60	1·68	0·455	0·61	1·15	0·38	1·39
March	4·685	2·830	2·48	2·26	1·66	3·298	1·51	4·29	2·360	3·21	1·53	1·69	3·65
April	2·564	2·940	2·82	2·46	2·13	6·296	2·45	4·15	1·770	2·34	2·65	2·88	1·51
May	1·740	1·420	1·39	2·00	1·41	3·054	1·22	2·32	1·790	2·08	1·12	1·57	1·84
June	3·991	2·710	2·27	2·16	1·65	3·610	2·12	3·84	4·045	3·68	2·34	2·19	2·02
July	1·701	1·560	1·43	1·10	1·08	2·002	0·50	1·64	3·225	1·90	0·97	1·08	1·04
August	3·977	3·100	2·90	4·86	3·32	6·224	1·74	3·94	2·045	2·65	2·19	2·78	2·42
September	5·861	3·830	3·22	3·95	2·72	5·261	2·50	6·33	3·655	3·45	4·20	2·44	2·62
October	3·497	2·150	1·56	1·55	1·13	1·245	0·61	2·33	2·055	2·26	0·89	0·97	2·65
November	3·476	2·880	2·29	2·60	2·04	4·192	1·82	3·73	2·680	3·01	2·10	1·74	2·18
December	3·249	0·690	0·42	0·17	0·05	0·371	0·00	0·99	0·255	0·51	0·28	0·07	0·45
Total	41·798	27·550	24·47	26·55	19·61	39·205	16·43	38·48	27·115	28·79	20·77	18·93	23·93

NOTES ON THE RAIN-FALL

FOR 1856, 1857.

The annexed Returns of the rain-fall have been furnished by the following gentlemen :—

ALLENHEADS.....Mr. Thos. J. Bewick, Allenheads Lead Mines.
BYWELL..... Ditto.
WYLAM.....G. C. Atkinson, Esq., Wylam Hall.
DURHAM.....Mr. A. Marsh, Durham Observatory.
WASHINGTON.....Mr. J. Watson, Washington Chemical Works.
NORTH SHIELDS..... .....Mr. Robert Spence.
NEWCASTLE.....Lieut. O'Grady, R.E.
STAMFORDHAM.....Rev. J. F. Bigge, Stamfordham Rectory.
LILBURN TOWER, near Alnwick, the seat of E. Collingwood, Esq. ..... „ „
RODDAM HALL, at the foot of the Cheviots, the seat of Wm. Roddam, Esq. ..... „ „
HOWICK HALL, the seat of Sir Frederick Grey ..... „ „
BISHOPWEARMOUTH.....Dr. Ogden.
WHORLTON, Teesdale.....T. Dodgson, Esq., Stubbs House, near Whorlton.

It is intended in future to record the number of wet and fine days at the above and many other stations, at which observations are now being made for the information of the Club.

In 1857, at Allenheads, rain or snow was registered on 255 days; at Bywell, on 185 days; at Durham, on 161 days; at Stamfordham, from July 15 to December 31, 74 days. At North Shields the following extraordinary falls of rain have occurred :—

1856.	1857.
May 27 and 28.....3·056	April 6.....2·397.
Aug. 7, 8, and 9 .....5·093	Aug. 6, 7, and 8.....5·129.
Sept. 27, 28, and 29.....3·476	

Days and Places of Meeting for the Year 1857.

Prestwick Car,.....May 19th.
Heselden Dene,.....June 9th.
Bishop Auckland,.....July 8th.
Chollerford,.....August 5th.
Barnard Castle,..... " 26th and 27th.
Ovingham and Cherry-burn,.....September 15th.

Officers for the Year ending February, 1858.

President.

William Kell, F.S.A.

Vice-Presidents.

Sir W. C. Trevelyan, Bart.
Joshua Alder.
Ralph Carr.
Dennis Embleton, M.D.
John Hogg, M.A., F.R.S., F.L.S., &c.
Thomas Sopwith, F.R.S., F.G.S.
John Storey, F.B.S.E.

Secretaries.

Edward Mather.
Daniel Oliver, Jun., F.L.S.

Treasurer.

Robert Y. Green.

Committee.

Rev. G. C. Abbes, B.A.
Thomas Austen.
Joseph Blacklock.
Thomas J. Bold.
St. John Crooks.
Albany Hancock.
Richard Howse, Jun.
Henry T. Mennell.
Frederick J. Peck.
A. S. Stevenson.
John Thompson.
George Wailes.

LIST OF MEMBERS

CORRECTED TO AUGUST 31, 1858.

Abbes, Rev. George C., B.A.	Cleadon Hall
Adamson, Charles	Rock Cottage, Jesmond
Adamson, William	Tynemouth
Ainley, William, M.R.C.S. ...	Bingley, Leeds
Alder, Joshua	Summerhill Terrace
Allison, James, jun.	Monkwearmouth
Allison, W. H.	East Boldon
Armstrong, George	Dean Street
Armstrong, Joseph	Jesmond Terrace
Atkinson, George C., Esq. ...	Wylam Hall
Atkinson, J. Ismay, M.R.C.S.	Wylam
Atkinson, Henry	Gateshead
Athey, Thomas	Cramlington
Austin, Thomas	Mosley Street
Backhouse, William	Shull, Darlington
Balmer, George	High Bridge
Barkus, Benjamin, M.D. ...	Gateshead
Bell, Henry	Tynemouth
Belt, George	Groat Market
Bethune, Rev. Angus	Seaham Harbour
Bewick, Thomas J.	Allenheads
Bigge, Rev. J. F., B.A. ...	Stamfordham Vicarage
Blacklock, Joseph	Summerhill Terrace
Blain, Thomas	Sunderland
Bleazby, R. W., M.D. ...	Northumberland Street
Blumer, Luke, M.R.C.S. ...	Monkwearmouth
Bold, Thomas John	Long Benton
Bolton, George	Burnupfield
Booth, George R.	Sunderland
Boyd, Edward	Urpeth

Boydell, Rev. Edward Neville Wingate
Bourdillon, H. ... ... Oxford Street
Bradley, George ... ... Clayton Street
Bramwell, J., M.D. ... ... North Shields
Broomfield, Thomas ... ... Eldon Street
Brown, W. H. ... ... North Shields
Browell, E. J. J. ... ... East Boldon
Bruce, Rev. J. C., LL.D., F.S.A. Percy Street
Bruce, Gainsford ... ... London
Brumell, Matthew, M.R.C.S. ... Morpeth
Bulman, George ... ... Sandhill
Burdon, Rowland, Esq. ... Castle Eden
Carr, Ralph, Esq. ... ... Hedgley, Alnwick
Carr, Rev. H. B., M.A. ... ... Whickham
Carr, W. J. ... ... Alnwick
Challoner, J. S. ... ... Benwell Lodge
Charlton, Edward, M.D. ... Eldon Square
Chartres, William ... ... Grey Street
Clayton, John ... ... Westgate Street
Coates, Thomas, M.R.C.S. ... Haydon Bridge
Coppin, John ... ... North Shields
Cooper, George ... ... West Clayton Street
Coxe, The Ven. Archdeacon Eglingham
Cox, J. H. ... ... Sunderland
Crawshay, Edmund ... ... Bensham
Creighton, William ... ... Morpeth
Crooks, St. John ... ... Sunderland
Crozier, W., C.E. ... ... Sunderland
Cunningham, D. ... ... Stockton-on-Tees
Daggett, William ... ... Victoria Terrace
Darnell, Rev. W. H., B.D. ... Stanhope
Dees, R. R. ... ... Wallsend
De Mey, W. F., M.D. ... ... Eldon Square
Dickson, William ... ... Alnwick
Dinning, Joseph ... ... Haydon Bridge
Dinning, William ... ... Gateshead

Dixon, A. W. ... ... Sunderland
Dobson, John ... ... New Bridge Street
Dodsworth, Frederick ... ... Collingwood Street
Donkin, A. S., M.D. ... ... Morpeth
Douglas, Robert ... ... Berwick
Douglas, Thomas M. ... ... Sunderland
Dunn, A. Mortimer ... ... St. Mary's Place
Eglinton, William ... ... Central Station
Ellison, Nathaniel, Esq. ... Murton House, Durham
Ellison, C. E. ... ... George Street
Embleton, Dennis, M.D. ... Northumberland Street
Embleton, R. C., L.R.C.S. ... Embleton, Northumberland
Emmerson, W. L., M.D. ... North Shields
Falconar, J. B., jun. ... ... West Clayton Street
Falconar, W. A. ... ... West Clayton Street
Falconar, Robert ... ... West Clayton Street
Featherstonhaugh, Rev. W., M.A. Edmondbyers
Fenwick, John, F.S.A. ... ... Ellison Place
Fenwick, John ... ... Preston, North Shields
Finch, Rev. T. ... ... Morpeth
Forster, W. J. ... ... Tynemouth
Forster, James ... ... White House, Gateshead
Foster, Robert ... ... North Shields
Frazer, Hugh ... ... Dean Street
Frost, Robert C., M.R.C.S. ... Picton Place
Gibb, C. J., M.R.C.S. ... ... Westgate Street
Gibson, Charles, M.D. ... ... Clayton Street
Glover, William ... ... Walbottle Dene House
Goddard, D. H. ... ... Grey Street
Gray, James J., M.R.C.S. ... Sunderland
Green, Rev. T. R., M.A. ... St. Mary's Place
Green, R. Y. ... ... St. Mary's Place
Green, William, jun. ... ... Framwellgate, Durham
Greenwell, Rev. W., M.A. ... University College, Durham
Greener, Martin ... ... Sunderland
Hancock, Albany ... ... St. Mary's Terrace

Hancock, John ... ... St. Mary's Terrace
Hardcastle, W. J. ... ... St. John's Lane
Hare, John ... ... Grey Street
Hall, James ... ... Northumberland Street
Hazlewood, Rev. B. ... ... Shotton
Headlam, T. E., Esq., M.P. ... Lincoln's Inn Fields, London
Hernaman, John ... ... Whitburn
Hills, E. S. ... ... Bensham
Hills, W. H. ... ... Sunderland
Hodge, George ... ... Seaham Harbour
Hogg, John, Esq., M.A., F.R.S., F.L.S. Norton, Stockton
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ERRATA.

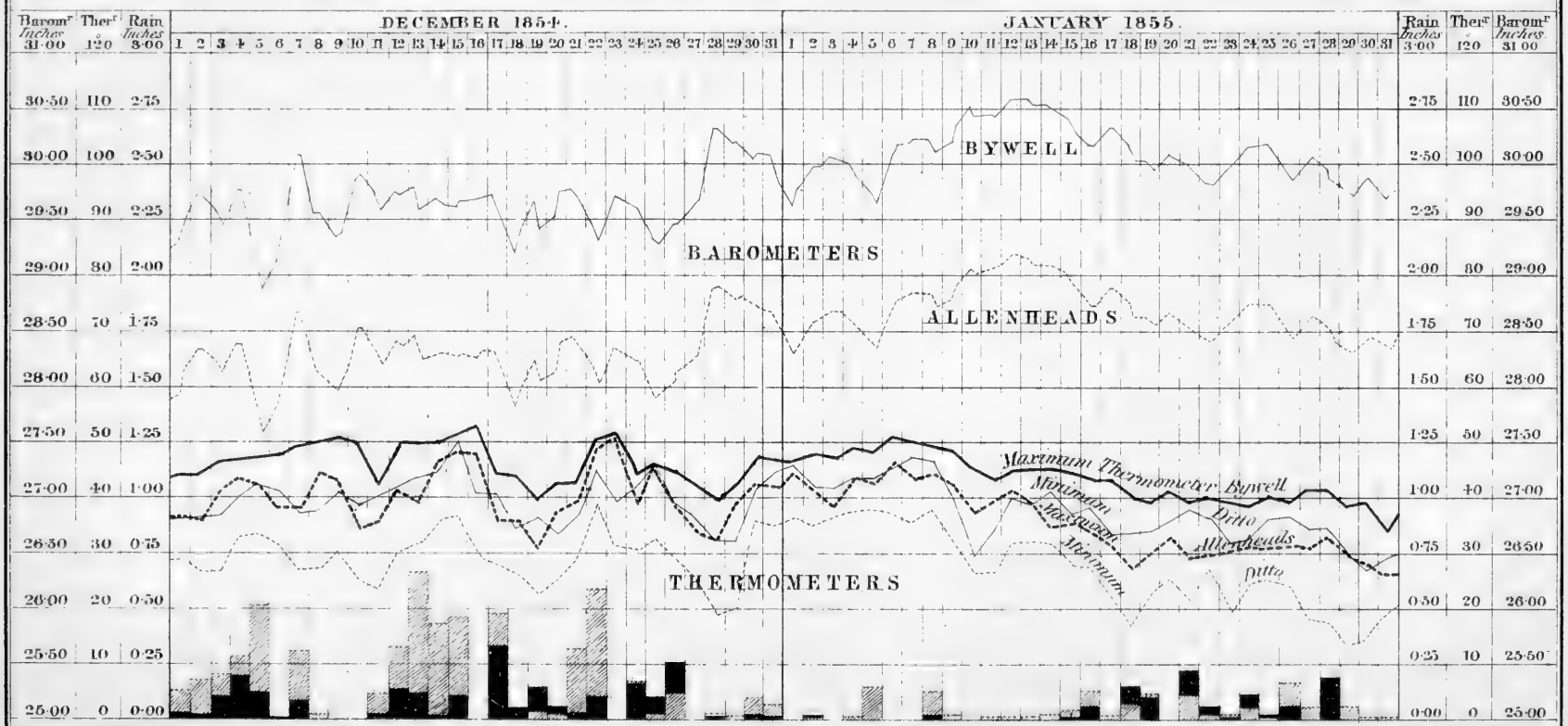
Page 3, line 29, *for* Dunstonbro' *read* Dunstanbro'.
„ 57, line 4, *for* R. Mennell *read* G. Mennell.
„ 72, line 3, *for* Berwick's *read* Berwicksh.
„ 234, line 9, *for* knarled *read* gnarled.
„ 291, *for* Sir Frederick Grey *read* Earl Grey.

DIAGRAM TO ACCOMPANY THE ANNIVERSARY ADDRESS OF T. SOPWITH, F.R.S.

SIMULTANEOUS METEOROLOGICAL OBSERV^NS *at Allenheads and Bywell during the Months of December 1854 and January 1855.*

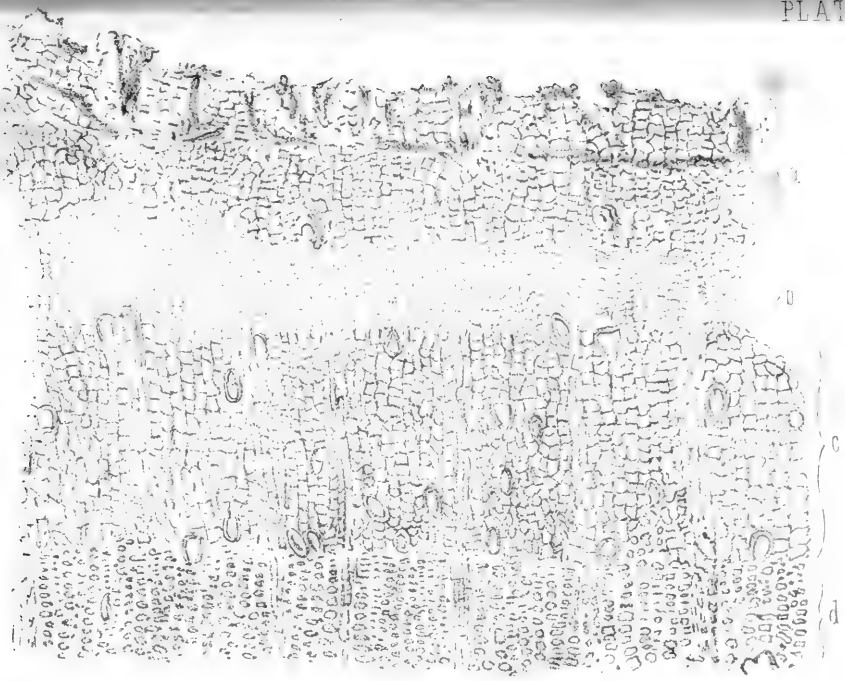
Allenheads is Latitude 54° 48′ 44″ N. Longitude 2° 16′ 23″ W. Height above the Sea 1360 Feet. The Dotted Lines represent the Allenheads Observ^ns

Bywell Ditto 54° 56′ 43″ N Ditto 1° 56′ 21½″ W. Ditto 50 Do Contanuous Do Bywell Ditto



The two highest undulating lines are the Barometrical registrations the four next below are the registrations of the Maximum and Minimum Thermometers. The solid or continuous lines in each case representing the Bywell and the dotted the Allenheads Observations. The record of the Rain & Snow reduced to Water is represented at the bottom Bywell being Black and Allenheads Shaded. All the Instruments used in taking the Observations have been compared with Standard Instruments by James Glaisher Esqre F.R.S., the Index Errors allowed for and the readings of the Barometers reduced to 32°. T.J.B.

M & M.W. Lambert, Newcastle



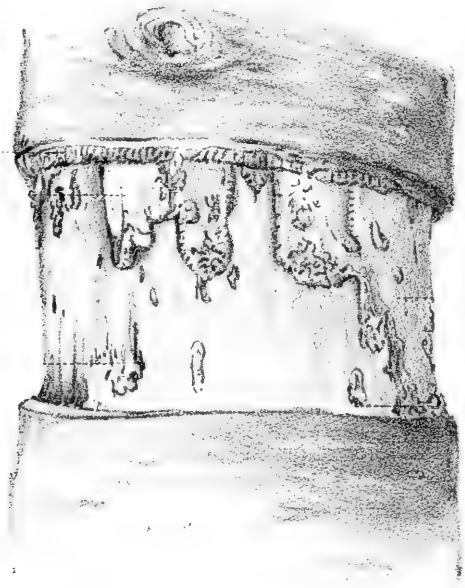


FIG. 2

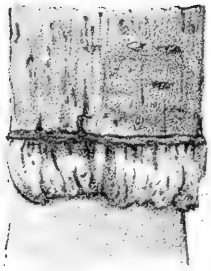


FIG. ?

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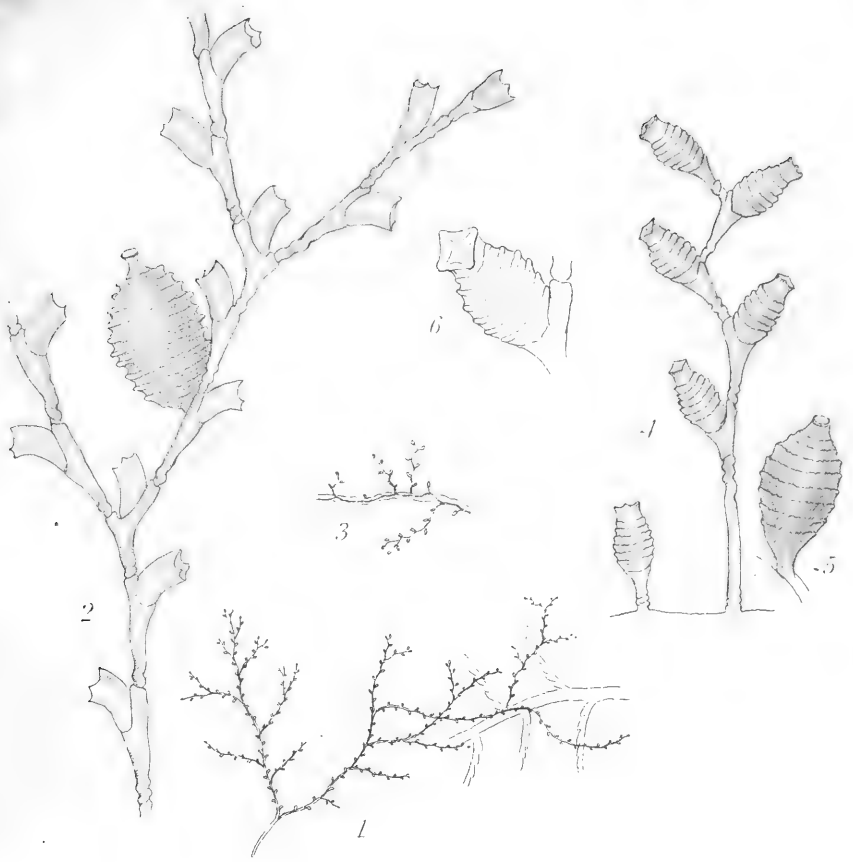
J. Basire, sc.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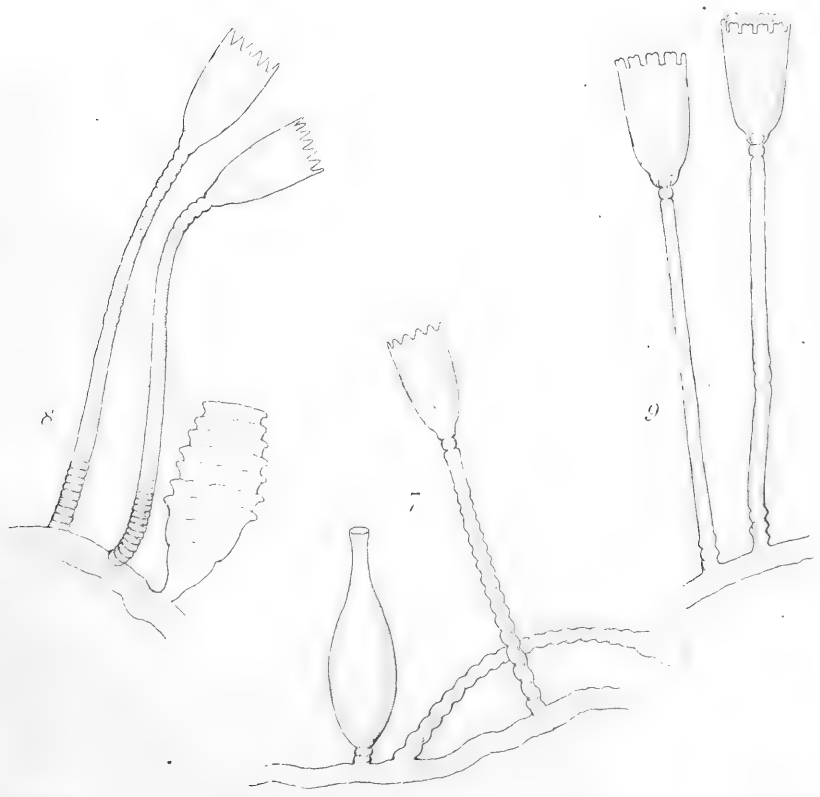
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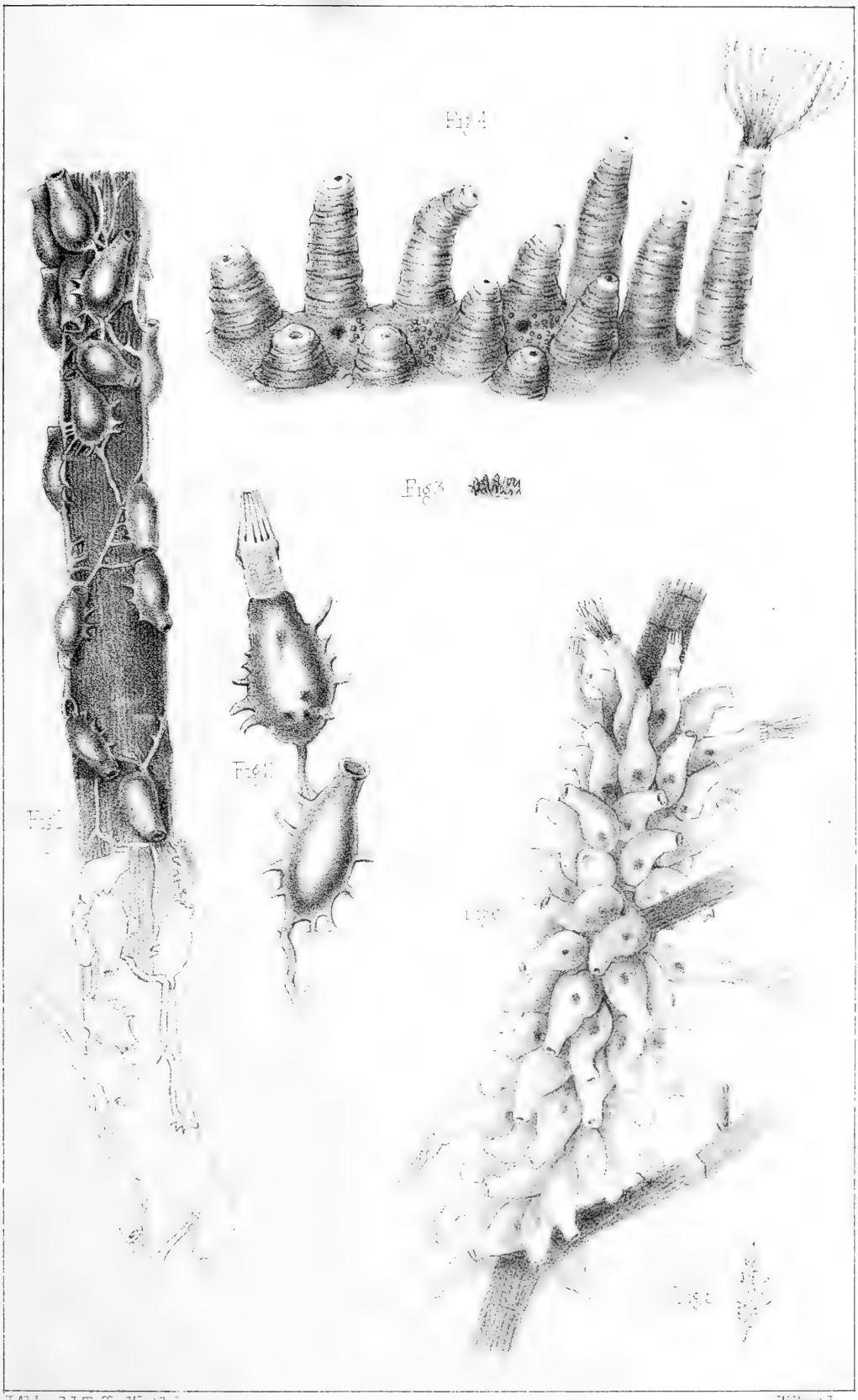
J. Alder del.

J. Basire, sc.

J. Alder del.

J. Basire, sc.

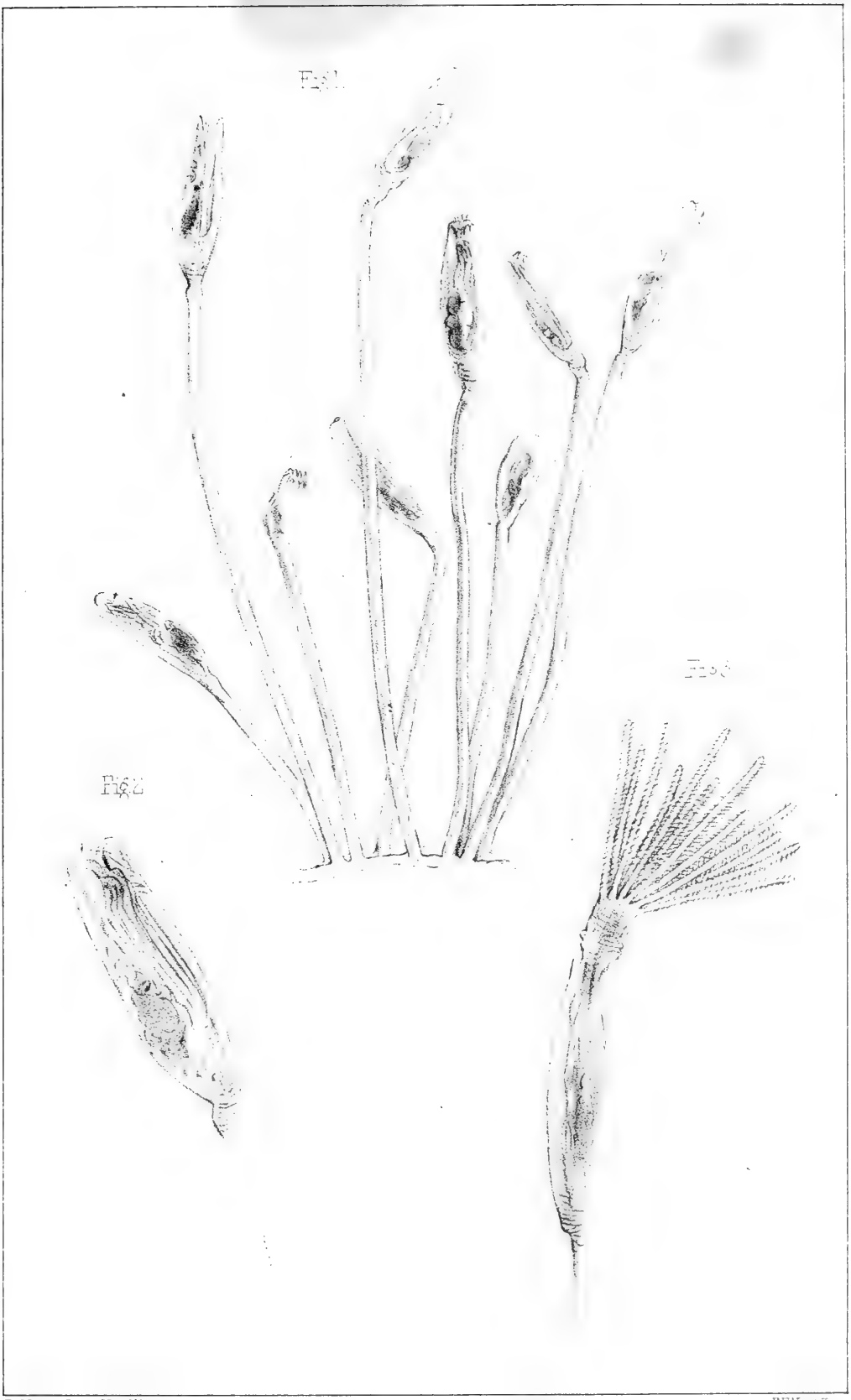
Plate VII.



J. Alder del. Tuffen West lith.

W. West Imp.

Plate II



J Alder, del. Tuffen West lith.

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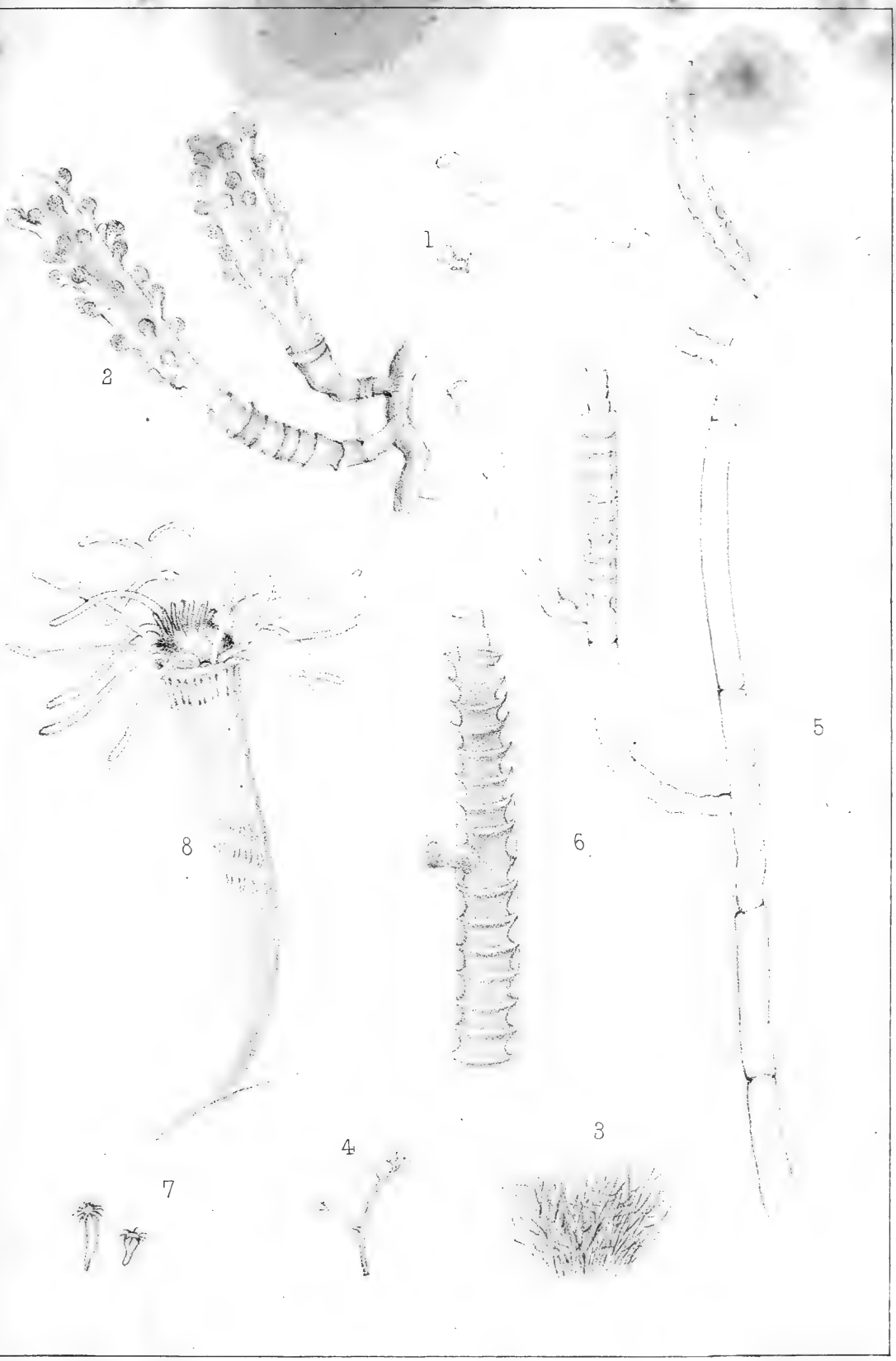

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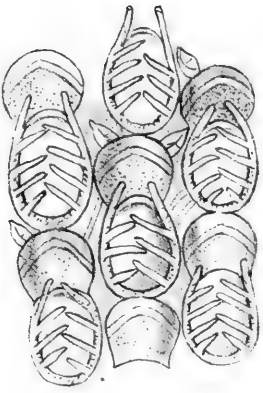

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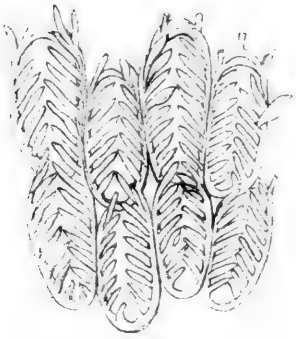

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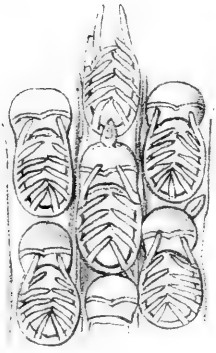

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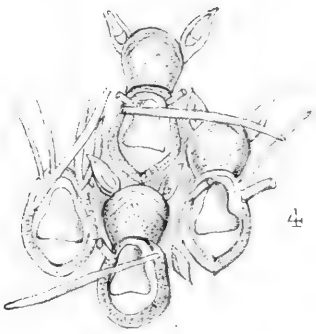

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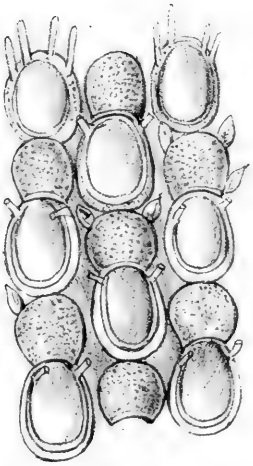

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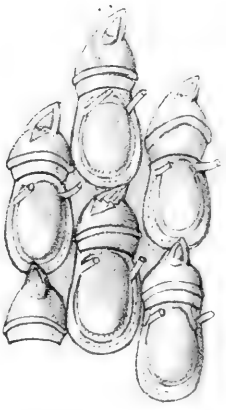

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J. Alder, del.

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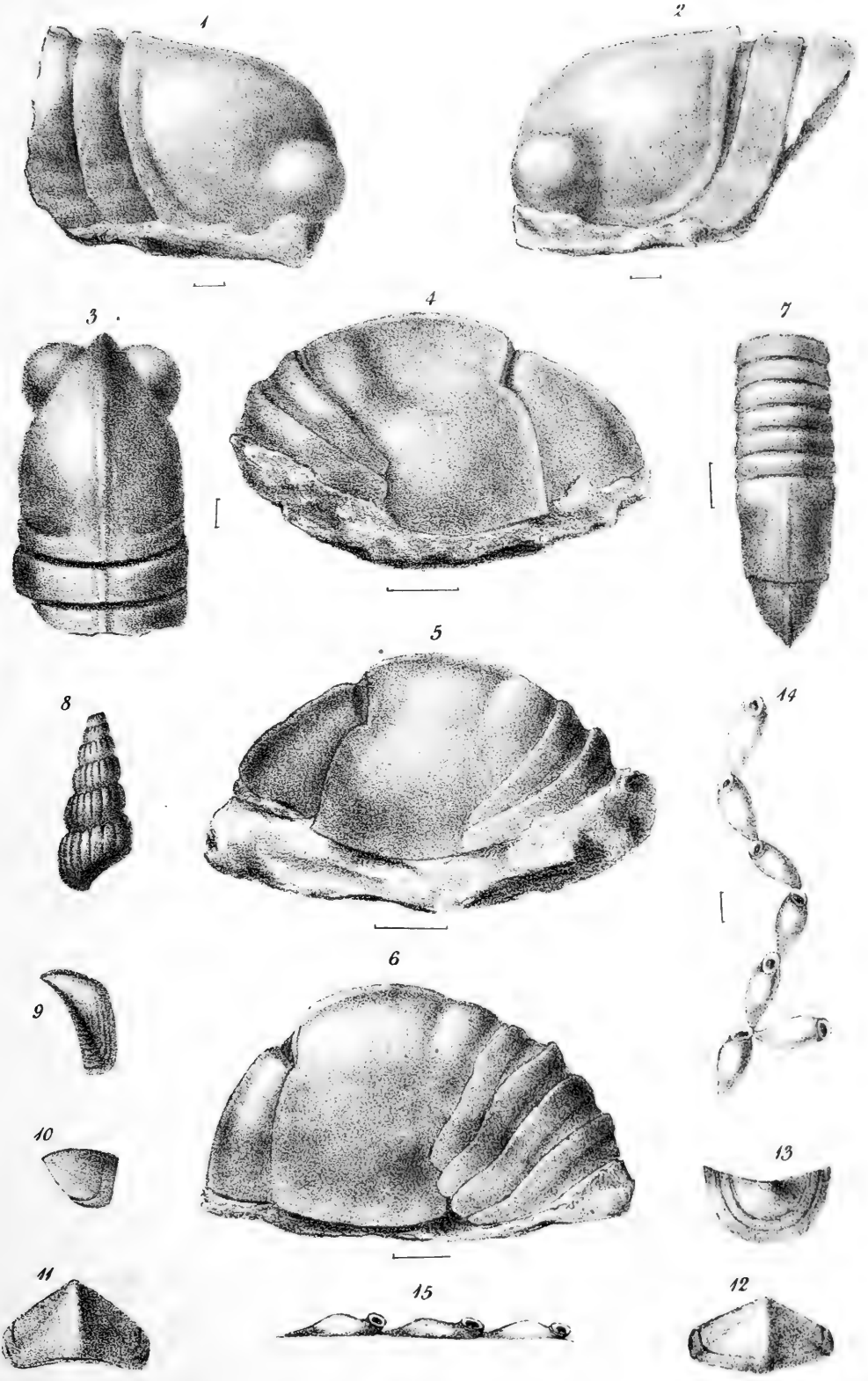

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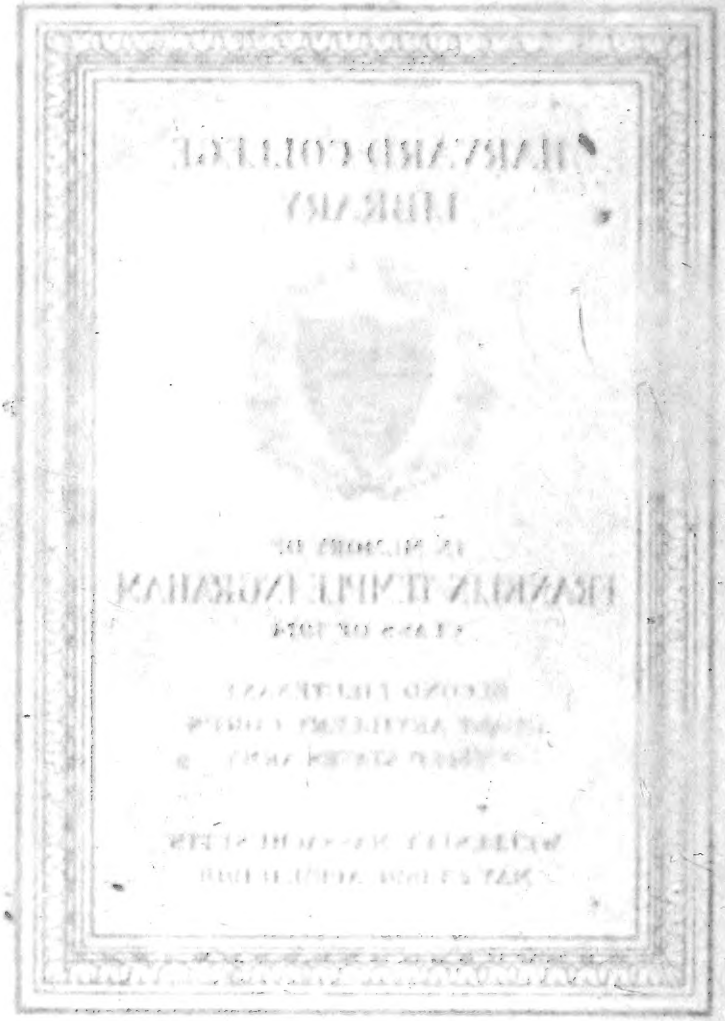

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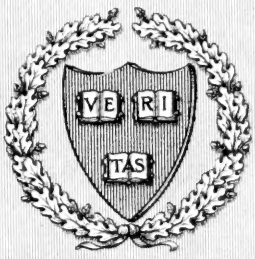

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